TP 13789E

Escape, Evacuation, and Rescue Research Project

by

F.G. Bercha
Bercha Engineering Limited
BERCHA GROUP

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Un sommaire français se trouve avant la table des matières.

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16. Abstract

This report describes the Escape, Evacuation, and Rescue (EER) research and development program leading to the implementation of performance-based EER standards for the Canadian East Coast offshore oil and gas industry. The principal tasks of the work were the following:

- Worldwide data and literature compilation and review.
- Development of a computerized EER simulator, the Risk and Performance Tool (RPT).
- Human factors experiments for essential RPT inputs.
- Application of the RPT to specific case studies.
- Program for the development of performance-based EER standards.

More than 640 citations were recorded, documented, and formatted for inclusion in the National Research Council Canada EER website. The RPT developed is a computerized model capable of simulating both the performance and the risks of components as well as total performance of any EER system. Data gaps identified with the RPT led to several experiments on human performance. Application of the RPT to several case studies aided the identification of potential performance-based EER standards. A program was proposed for the development of EER standards that would define global and specific standards, a development procedure, and research needs for the development of meaningful standards applicable to the extreme conditions associated with offshore emergencies for which EER systems need to be used.

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16. Résumé

Ce rapport décrit le programme de recherche et développement Secours, évacuation et sauvetage (SES) visant la mise en œuvre de normes de rendement touchant les systèmes SES destinés aux installations pétrolières et gazières exploitées au large de la côte est du Canada. Voici les principales tâches que comportait le projet :

- Recherche documentaire à l'échelle de la planète.
- Développement d'un logiciel de simulation SES, appelé outil d'évaluation du risque et du rendement (OERR).
- Expériences sur les facteurs humains afin d'alimenter l'OERR en données essentielles.
- Application de l'OERR à des études de cas.
- Mise au point d'un programme d'élaboration de normes de rendement pour les systèmes SES.

Plus de 640 citations ont été enregistrées, documentées et formatées pour être intégrées au site Web du Conseil national de recherches du Canada consacré aux systèmes SES. L'OERR est un modèle informatique capable de simuler le risque et le rendement associés à tout système SES. Le modèle peut être appliqué à chacun des éléments du système et au système global. Pour combler des lacunes dans la base de données de l'OERR, les chercheurs ont mené diverses expériences sur les facteurs humains. L'application de l'OERR à plusieurs études de cas a aidé à cerner des pistes pour l'élaboration de normes de rendement. Enfin, les chercheurs ont proposé, comme suite à leurs travaux, la mise sur pied d'un programme d'élaboration de normes globales et spécifiques touchant les systèmes SES. Ce programme comporte, outre la définition d'une méthode d'élaboration des normes, la conduite des recherches complémentaires nécessaires à l'élaboration de normes pleinement adaptées aux conditions extrêmes associées aux interventions en mer auxquelles sont destinés les systèmes SES.

17. Mots clés
Secours, évacuation, sauvetage, SES, simulation, facteurs humains, sécurité maritime, normes de rendement SES

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EXECUTIVE SUMMARY

Summary of Work

A multidisciplinary Escape, Evacuation, and Rescue (EER) research program was initiated by the Transportation Development Centre effective January 1, 2000, to lead to the implementation of performance-based EER standards for the East Coast offshore oil and gas industry. The work was carried out with Bercha Engineering Limited as prime contractor, together with seven subcontractors providing expertise or facilities in their areas of EER specialization. The principal tasks of the work included the following:

- Worldwide data and literature compilation and review.
- Development of a computerized EER simulator, the Risk and Performance Tool (RPT).
- Human factors (HF) experiments for essential RPT inputs.
- Application of the RPT to specific case studies.
- Design of a program for the development of performance-based EER standards.
- Reporting, conclusions, and recommendations.

The worldwide data and literature search was conducted online through institutional libraries, organizations' and manufacturers' libraries, and the Bercha network. More than 640 entries were recorded, documented, and forwarded to National Research Council Canada (NRC) for inclusion in the EER website.

The RPT is a computerized model capable of simulating both the performance and the risks (success or failure) of components of any EER system both individually and together as a whole. RPT architecture is illustrated in Figure 1. One of the important outputs of the RPT is a ranking or estimate of the success that a given EER component configuration is likely to achieve for different environmental conditions. The RPT can operate either in a point value mode or a Monte Carlo mode. The Monte Carlo mode is advantageous not only because it permits the simulation of uncertainties through use of input distributions, but also because it eliminates the need for extensive network analysis of alternatives by incorporating appropriate decision distributions.

Some of the data gaps identified in the initial use of the RPT required the conduct of various experiments on human performance. Such experiments were designed and conducted at the Survival Systems test facility in Halifax Harbour.

Application of the RPT to several case studies illustrated its use in the identification of potential performance-based EER standards. Such EER standards, as well as those of other jurisdictions, facilitated the definition of a broad framework for EER standards categories and the development of EER standards.

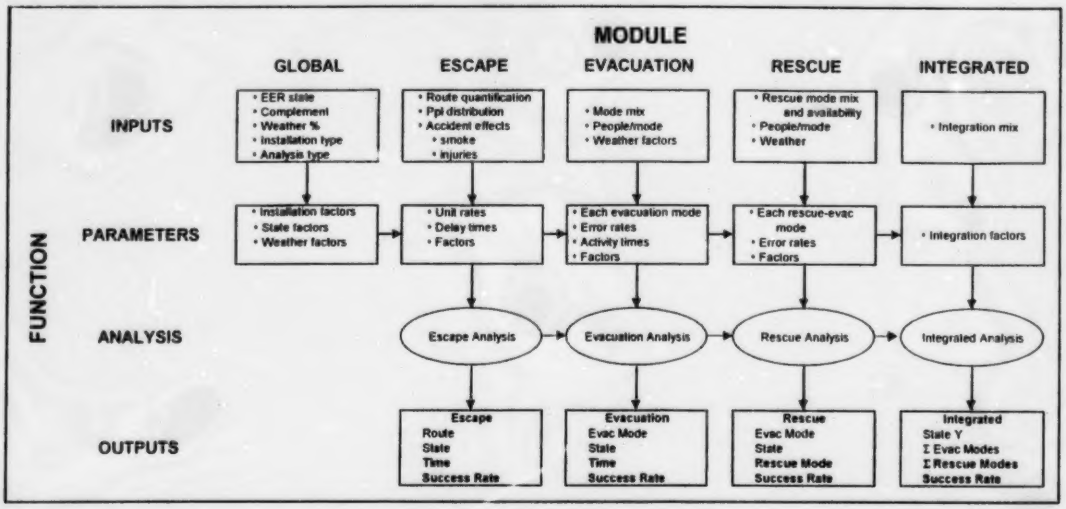

MODULE
GLOBAL
ESCAPE
EVACUATION
RESCUE
INTEGRATED
FUNCTION
INPUTS
PARAMETERS
ANALYSIS
OUTPUTS
• EER state
• Complement
• Weather %
• Installation type
• Analysis type
• Route quantification
• Ppl distribution
• Accident effects
• smoke
• injuries
• Mode mix
• People/mode
• Weather factors
• Rescue mode mix and availability
• People/mode
• Weather
• Integration mix
• Installation factors
• State factors
• Weather factors
• Unit rates
• Delay times
• Factors
• Each evacuation mode
• Error rates
• Activity times
• Factors
• Each rescue-evac mode
• Error rates
• Factors
• Integration factors
Escape Analysis
Evacuation Analysis
Rescue Analysis
Integrated Analysis
Escape
Route
State
Time
Success Rate
Evacuation
Evac Mode
State
Time
Success Rate
Rescue
Evac Mode
State
Rescue Mode
Success Rate
Integrated
State Y
Σ Evac Modes
Σ Rescue Modes
Success Rate

Figure 1 **Expected value RPT architecture and screen references**

A general program for the development of EER standards was designed, defining global and specific performance standards, a Standards Development Task Force, and specific research requirements for meaningful standards applicable to extreme conditions normally associated with the types of emergencies for which offshore EER systems need to be used.

The reporting phase consisted of progress and final reporting. Four progress reports were generated and presented at strategic progress meetings throughout the work. The final report generally incorporates the information from the progress reports and expands the description of the performance-based standard development program.

Conclusions

General Conclusions

The following general conclusions are drawn from the work:

- Although extensive model data and literature exist on EER, information and data meeting the objectives of the present work are not readily available.
- EER performance in extreme conditions is anecdotally described, but no directly usable parameters are given.
- The EER RPT developed under this work has been found to adequately simulate the reliability and performance of EER procedures under drill and calm-to-moderate environmental conditions.

- RPT simulation of life-threatening circumstances or extreme environmental and accident conditions is built into the RPT, but cannot be reliably simulated because of a lack of statistically robust input parameters.
- The RPT serves to point out specific data gaps to permit adequate simulation of life-threatening situations and therefore serves as a good basis for additional EER research recommendations.
- The performance-based standard development program should proceed without delay. Both a categorization of standards and a two-year development program have been presented in this report.

Data Compilation Conclusions

More than 640 individual entries relevant to EER and EER systems, procedures, and regulations have been identified and catalogued under this project. Although many aspects of EER knowledge are represented in these data and literature, none are immediately applicable to the fulfilment of all the objectives of the current work, particularly extreme condition human and equipment performance. Many items, however, provide good supporting information such as anecdotal descriptions of EER performance under extreme conditions (e.g., Ocean Ranger and Ocean Odyssey).

RPT Development Conclusions

The following conclusions on the RPT may be reached:

- The RPT adequately simulates performance and success rate for EER processes for which validation data were available. Such processes were restricted to drills under calm or moderate environmental conditions.
- The RPT has incorporated in it features that simulate EER under severe and extreme conditions. Because of input parameter inadequacy for such conditions, associated simulation results are unreliable. Generally, the required input parameters pertain to human and physical component performance under extreme conditions.
- Application of the RPT in its current state to specific case studies provides a wealth of information applicable to the development of performance-based standards. This information ranges from very specific items such as the importance of abandonment time limits, to very general information such as the overall EER success rate illustrated in Figure 2.
- As can be seen in Figure 2, the success rates for the severe and extreme weather conditions currently predicted are unacceptably low – probably because of the need to err on the side of conservatism with uncertainties in input data.

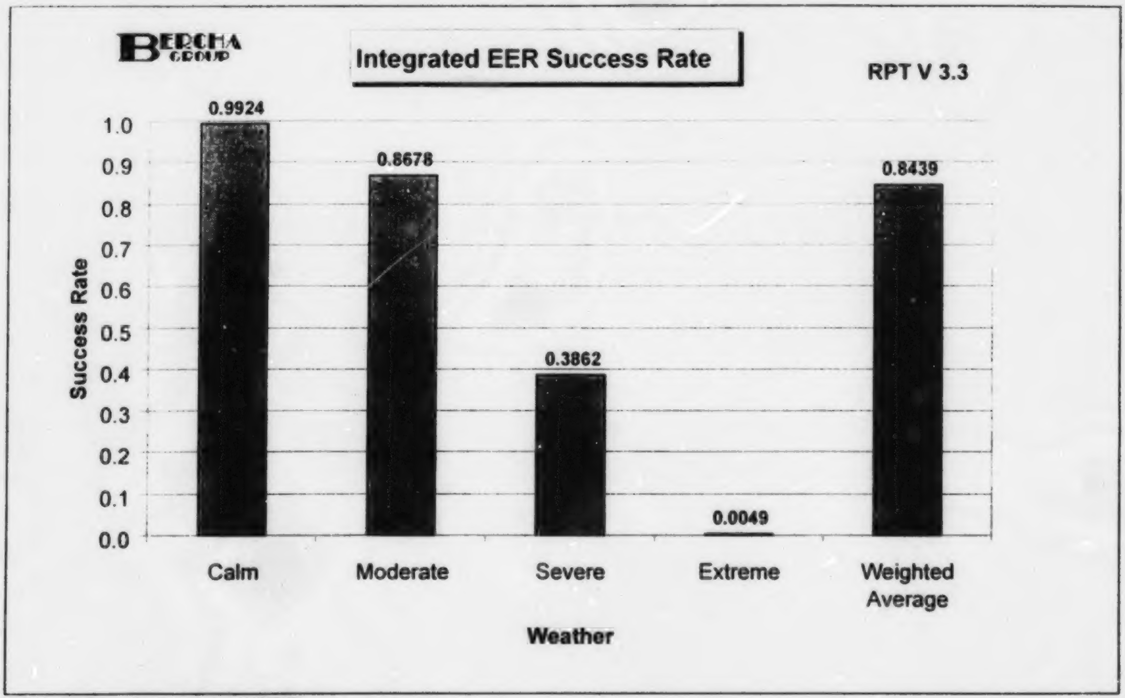


Figure 2 Integrated EER success rate

HF Data Generation

The HF data experiments designed and conducted under this program generated excellent verifiable data and set a format or template for conducting further experiments. The data collected were for relatively simple escape parameters; however, certain important relationships among individual and group performance parameters, which had not previously been identified, were quantified in these experiments.

RPT Application to Case Study

The RPT was successfully applied to a case study based on the Sable Offshore Energy Project Tier I safety case development. Both the point value and a Monte Carlo mode were applied and extensive sensitivity studies on the effect of altering the EER system configuration were carried out. Typical high level results from the case study are summarized in Table 1.

Development of Performance-Based Standards

A program for the development of performance-based standards can be initiated on the basis of the work to date under this EER project. Additional research will be required for the development of performance-based standards that will be applicable to protect personnel adequately in severe or extreme conditions such as those encountered in many emergencies necessitating the use of EER systems.

Table 1 **Results from RPT case study application**

RESULTS
Escape success is high, provided alternative routes to the temporary safe refuge from each location exist.
All cases are good for calm weather and very bad for extreme weather.
Performance in moderate and severe weather is what really counts.
Combinations of independent systems perform better than ones with interdependent systems.
Low helicopter availability decreases expected evacuation success, but total dependence on helicopters also reduces evacuation success due to their limited severe/extreme weather capability.
Abandonment (escape plus evacuation) time limit is very critical and all cases perform poorly for very short abandonment times.
RPT clearly shows sensitivity of EER success to different EER configurations.

Recommendations

General Recommendations

The following general recommendations can be made based on the work described in this final report:

- Proceed without delay with the performance-based standards development program.
- Continue EER research in critical areas, including human and physical component performance under severe and extreme conditions.
- Optimize the RPT as additional data become available from the research programs.
- Utilize the RPT in support of the performance-based standards development program.

Data Compilation Recommendations

The following recommendations relate to data compilation and cataloguing:

- Compile all newly identified data and literature, including that from private and operator databases.
- Continue to catalogue the data and incorporate it into the NRC EER database and website currently under construction.

RPT Development

The following recommendations can be made in relation to RPT development:

- Continue to optimize the RPT as new requirements or features are identified through its use in support of the performance-based standard development program.
- As severe and extreme condition personnel and system performance data become available, modify the structure of the RPT as warranted, and integrate the parameters and factors derived from the data into the RPT.
- Utilize the RPT in the standards development program.

HF Data

The following research programs are required to fulfil the needs of the RPT for the simulation of risk and performance under accident and extreme environmental conditions:

- Human performance under extreme conditions.
- Environmental and accident effects on human performance in moderate to severe conditions.
- Environmental and accident effects on EER system physical components under extreme conditions.

RPT Applications

Continue to use the RPT for selected case studies as required in support of the standards development program. Application of the RPT to life-threatening and extreme environment situations should be done first to identify the data gaps, and then with caution until the necessary research to identify and quantify appropriate parameters has been completed and integrated into the RPT. Once these parameters are quantified, the RPT will be the state-of-the-art method for analyzing EER under the full spectrum of accident, complement, and environment conditions from calm to extreme.

Performance-Based Standard Development Program

The performance-based standard development program flow chart for the next two years is illustrated in Figure 3. As can be seen, important elements of the standards development program include the following:

- Establishment of a Task Force of appropriate representation from regulators, industry, and technical experts from the EER community.
- Stakeholder consultation outside the confines of the Task Force.
- A systematic sequential approach to the development of performance-based standards, including the following steps:

  - Definition of form and categories of standards illustrated in Figure 4.
  - Initial draft of standards.
  - Conduct of necessary research to fulfill information requirements for extreme conditions as outlined in the section on HF Data.
  - Specification of standards including quantitative thresholds for different states of emergencies.
  - Final drafting and specification of standards.
  - Promulgation of standards.
- Conduct of the necessary supportive research, summarized in Table 2, to assure the development of standards that are meaningful for life-threatening situations against which they are intended to protect personnel.

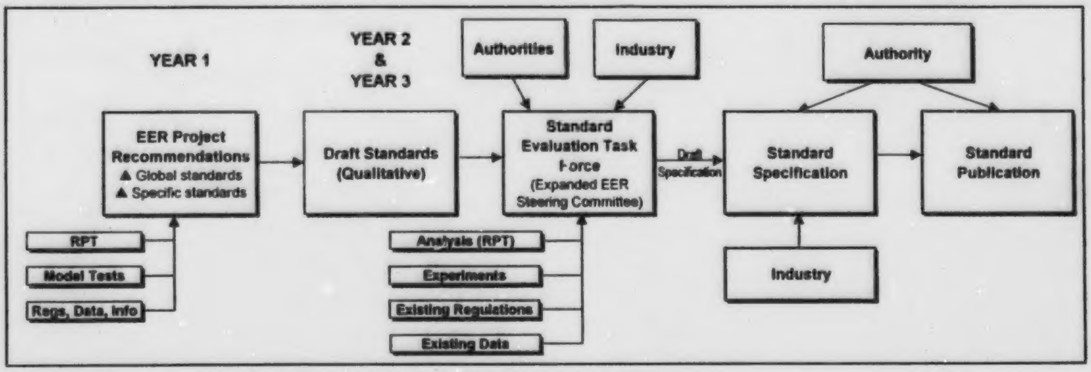
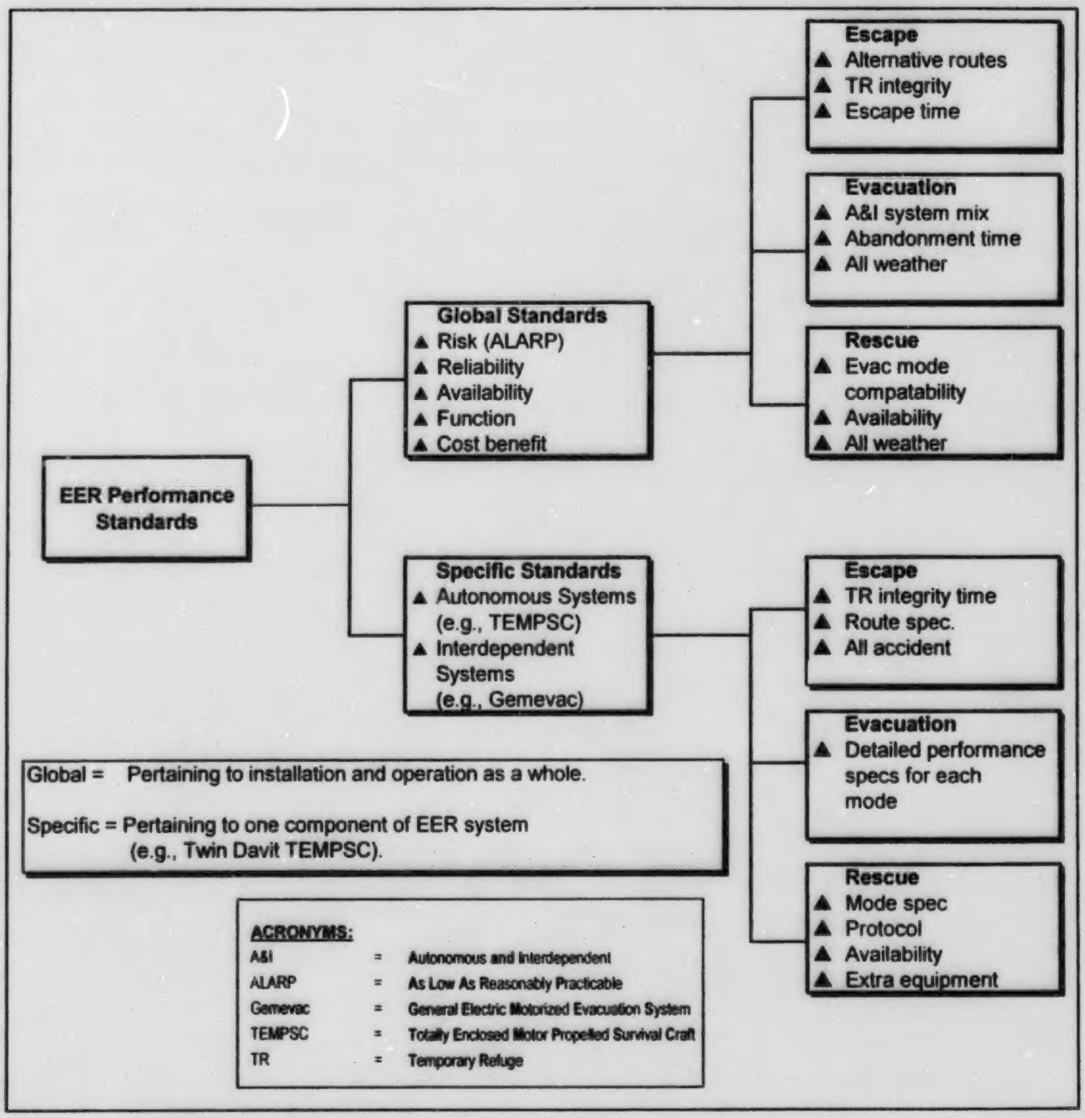

YEAR 1
YEAR 2 & YEAR 3
Authorities
Industry
Authority
EER Project Recommendations
▲ Global standards
▲ Specific standards
Draft Standards (Qualitative)
Standard Evaluation Task Force (Expanded EER Steering Committee)
Draft Specification
Standard Specification
Standard Publication
RPT
Model Tests
Regs, Data, Info
Analysis (RPT)
Experiments
Existing Regulations
Existing Data
Industry

Figure 3 Performance standards development program


EER Performance Standards
Global Standards
▲ Risk (ALARP)
▲ Reliability
▲ Availability
▲ Function
▲ Cost benefit
Specific Standards
▲ Autonomous Systems (e.g., TEMPSC)
▲ Interdependent Systems (e.g., Gemevac)
Escape
▲ Alternative routes
▲ TR integrity
▲ Escape time
Evacuation
▲ A&I system mix
▲ Abandonment time
▲ All weather
Rescue
▲ Evac mode compatability
▲ Availability
▲ All weather
Escape
▲ TR integrity time
▲ Route spec.
▲ All accident
Evacuation
▲ Detailed performance specs for each mode
Rescue
▲ Mode spec
▲ Protocol
▲ Availability
▲ Extra equipment

Global = Pertaining to installation and operation as a whole.

Specific = Pertaining to one component of EER system (e.g., Twin Davit TEMPSC).

ACRONYMS:

A&I = Autonomous and Interdependent
ALARP = As Low As Reasonably Practicable
Gemevac = General Electric Motorized Evacuation System
TEMPSC = Totally Enclosed Motor Propelled Survival Craft
TR = Temporary Refuge

Figure 4 **Performance standard categories**

Table 2 EER research to support standard development

ITEM	RESEARCH AREA
1	Human performance under extreme conditions
2	Moderate and severe environmental and accident effects on human performance
3	Environmental and accident effects on EER system physical component reliability
4	Additional data compilation
5	Site visits and training
6	Detailed planning of experiments
7	Integration of new data into RPT

SOMMAIRE

Sommaire des travaux

Le 1er janvier 2000, le Centre de développement des transports lançait un programme de recherche multidisciplinaire, intitulé Secours, évacuation et sauvetage (SES), visant la mise en œuvre de normes de rendement touchant les systèmes SES destinés aux installations pétrolières et gazières exploitées au large de la côte est du Canada. Les travaux ont été réalisés par la société Bercha Engineering Limited (contractant principal), entourée de sept sous-contractants offrant une expertise ou des installations dans leurs domaines de spécialité respectifs. Voici les principales tâches exécutées par les chercheurs :

- Recherche documentaire à l'échelle de la planète.
- Développement d'un simulateur informatisé de système SES, appelé outil d'évaluation du risque et du rendement (OERR).
- Expériences sur les facteurs humains destinées à alimenter l'OERR en données essentielles.
- Application de l'OERR à des études de cas.
- Mise au point d'un programme d'élaboration de normes de rendement pour les systèmes SES.
- Rédaction de rapports et formulation de conclusions et de recommandations.

La recherche documentaire a été menée en ligne auprès de bibliothèques d'établissements, d'organismes et de constructeurs du monde entier, ainsi que dans le réseau Bercha. Plus de 640 citations ont été enregistrées, documentées et transmises au Conseil national de recherches du Canada (CNRC) pour qu'il les intègre à son site Web consacré aux systèmes SES.

L'OERR est un modèle informatisé capable de simuler le rendement et les risques (succès ou échec) liés à chaque élément d'un système SES, ou au système dans son ensemble. La figure 1 montre l'architecture de l'OERR. Une des données de sortie les plus importantes du simulateur est l'estimation du succès (ou rendement) d'une configuration donnée des éléments d'un système SES, dans différentes conditions environnementales. L'OERR peut fonctionner en mode valeurs ponctuelles ou selon la méthode Monte-Carlo. La méthode Monte-Carlo est avantageuse non seulement parce qu'elle permet de simuler les incertitudes, à l'aide de distributions de données d'entrée, mais aussi parce qu'elle élimine la nécessité d'un long travail d'analyse d'options, en incorporant des distributions de décisions appropriées.

Les premières applications de l'OERR ayant révélé des lacunes dans les données sur les facteurs humains, diverses expériences ont été menées pour combler ces lacunes. Ces expériences ont été conçues et menées à l'installation d'essai de systèmes de survie, dans le port d'Halifax.

L'application de l'OERR à plusieurs études de cas a démontré son utilité pour cerner les normes de rendement qu'il serait possible d'élaborer. Ces normes, de même que les normes appliquées dans d'autres territoires, ont aidé à établir un cadre général pour la catégorisation des normes pour systèmes SES et pour l'élaboration de ces normes.

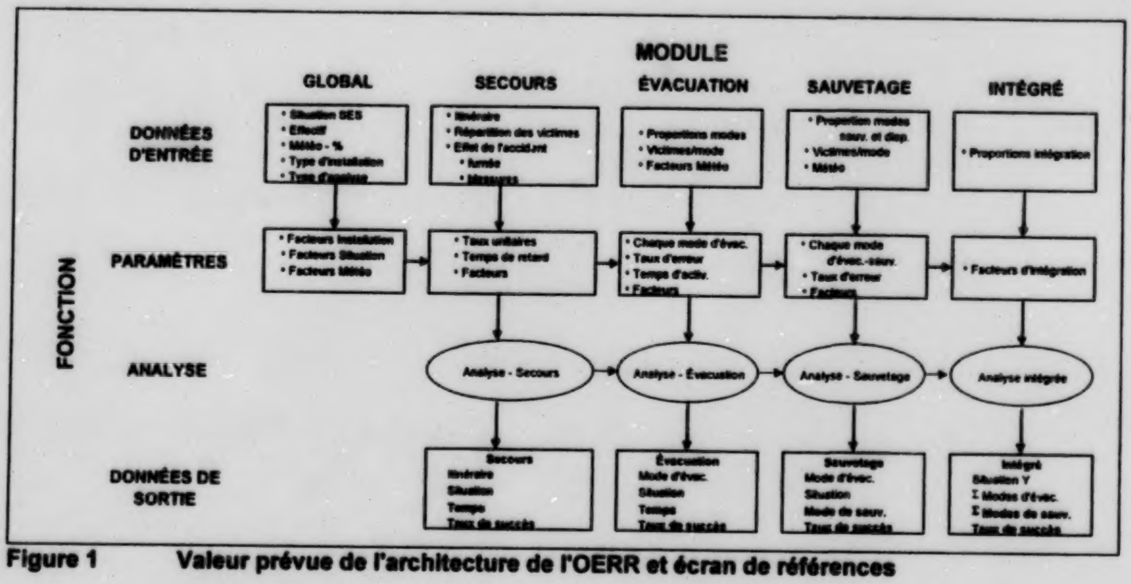

MODULE
GLOBAL
SECOURS
ÉVACUATION
SAUVETAGE
INTÉGRÉ
FONCTION
DONNÉES D'ENTRÉE
PARAMÈTRES
ANALYSE
DONNÉES DE SORTIE
• Situation SES
• Effectif
• Météo - %
• Type d'installation
• Type d'analyse
• Itinéraire
• Répartition des victimes
• Effet de l'accident
• fumée
• Mesures
• Proportions modes
• Victimes/mode
• Facteurs Météo
• Proportion modes sauv. et disp.
• Victimes/mode
• Météo
• Proportions intégration
• Facteurs Installation
• Facteurs Situation
• Facteurs Météo
• Taux unitaires
• Temps de retard
• Facteurs
• Chaque mode d'évac.
• Taux d'erreur
• Temps d'activ.
• Facteurs
• Chaque mode d'évac.-sauv.
• Taux d'erreur
• Facteurs
• Facteurs d'intégration
Analyse - Secours
Analyse - Évacuation
Analyse - Sauvetage
Analyse intégrée
Secours
Itinéraire
Situation
Temps
Taux de succès
Évacuation
Mode d'évac.
Situation
Temps
Taux de succès
Sauvetage
Mode d'évac.
Situation
Mode de sauv.
Taux de succès
Intégré
Situation Y
Σ Modes d'évac.
Σ Modes de sauv.
Taux de succès

Figure 1 Valeur prévue de l'architecture de l'OERR et écran de références

Un vaste programme d'élaboration de normes de rendement pour les systèmes SES a été mis sur pied. Ce programme définit les normes de rendement globales et spécifiques à élaborer, désigne un groupe de travail sur l'élaboration des normes, et précise les recherches complémentaires nécessaires à l'élaboration de normes pleinement adaptées aux conditions extrêmes associées aux interventions en mer auxquelles sont destinés les systèmes.

Quatre rapports provisoires ont été déposés lors de réunions stratégiques tenues au cours des travaux. Le rapport final résume le contenu des rapports provisoires et expose en détail le programme d'élaboration des normes de rendement.

Conclusions

Conclusions générales

Voici les grandes conclusions tirées des travaux :

- Il existe une riche base de données et de connaissances sur les systèmes SES, mais il n'est pas facile d'en dégager l'information nécessaire pour mener à bien les présents travaux.
- La documentation consultée décrit empiriquement le rendement des systèmes SES dans des conditions extrêmes, mais ne donne pas de paramètres directement utilisables.
- L'OERR développé dans le cadre des présents travaux s'est révélé simuler adéquatement la fiabilité et l'efficacité des procédures SES au cours d'exercices d'évacuation dans des conditions environnementales allant de calmes à modérées.

- Les données de base du simulateur comprennent des situations qui mettent la vie en danger, des conditions environnementales extrêmes et des conditions d'accidents, mais les simulations ne peuvent être fiables, en raison du manque de paramètres d'entrée statistiquement robustes.
- L'OERR sert à préciser la nature des données manquantes pour permettre une simulation adéquate de situations menaçantes pour la vie. Il s'avère donc utile pour formuler des recommandations quant à la poursuite de recherches sur les systèmes SES.
- Il convient de lancer sans délai le programme d'élaboration de normes de rendement. Ce rapport contient une catégorisation des normes et un programme d'élaboration étalé sur deux ans.

Conclusions concernant la compilation de données

Plus de 640 citations concernant le secours, l'évacuation et le sauvetage, et les systèmes, procédures et réglementations se rapportant aux opérations SES, ont été relevées et cataloguées dans le cadre du présent projet. Malgré sa large portée, cette information ne répond pas à tous les besoins des présents travaux, notamment en ce qui a trait aux conditions extrêmes auxquelles sont soumis le personnel et l'équipement des installations en mer. Une foule de données utiles ont toutefois été glanées, comme des descriptions empiriques du rendement de systèmes SES dans des conditions extrêmes (p. ex., Ocean Ranger et Ocean Odyssey).

Conclusions touchant le développement de l'OERR

Les conclusions qui suivent peuvent être tirées de l'OERR :

- L'OERR simule adéquatement le rendement et le taux de succès de processus SES pour lesquels des données de validation existent. Ces processus se limitent à des exercices d'évacuation dans des conditions environnementales calmes ou modérées.
- L'OERR peut simuler des opérations SES dans des conditions rigoureuses et extrêmes. Mais à cause de lacunes dans les paramètres d'entrée pour ces conditions, les résultats des simulations ne sont pas fiables. Règle générale, les paramètres d'entrée manquants ont trait aux facteurs humains et aux performances de l'équipement dans des conditions extrêmes.
- L'application de la version actuelle de l'OERR à des études de cas procure une mine d'informations applicables à l'élaboration des normes de rendement. Cette information est à la fois très spécifique, comme l'importance de déterminer des limites de temps pour l'abandon, et très générale, comme le taux de succès global des systèmes SES, illustré à la figure 2.
- Comme on le voit à la figure 2, les taux de succès actuellement prédits sont excessivement bas dans des conditions météorologiques rigoureuses et extrêmes – vraisemblablement en raison de la grande prudence que l'on doit exercer, du fait de l'incertitude des données d'entrée.

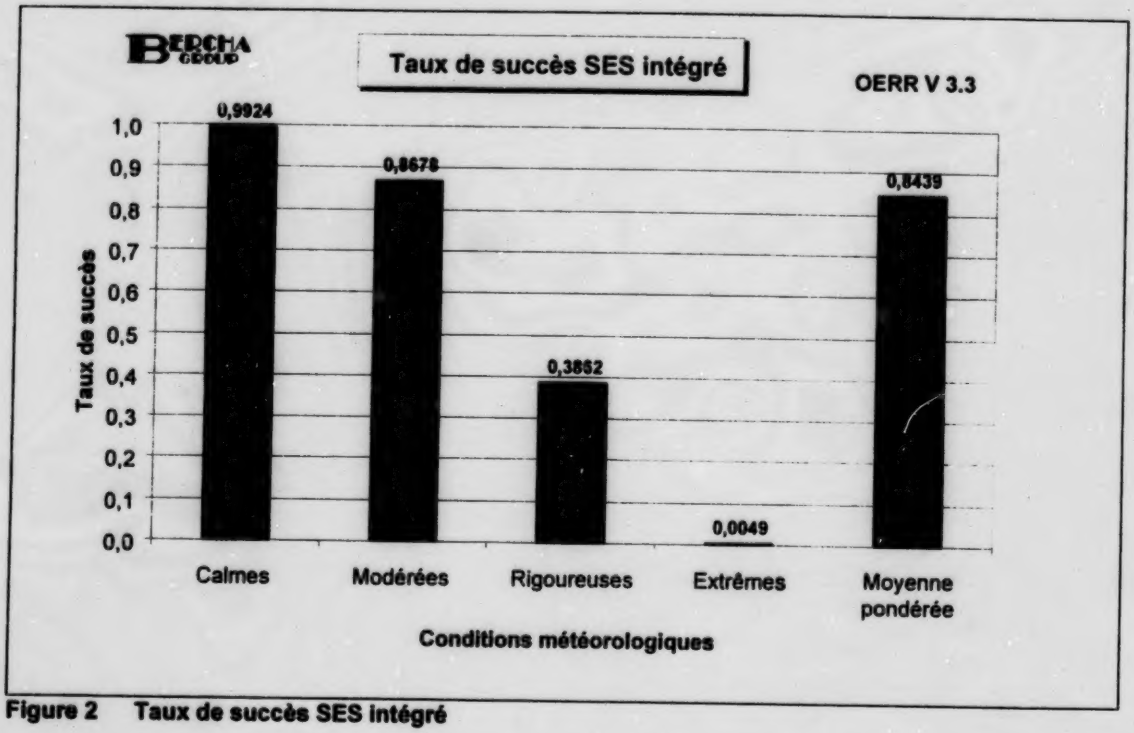


Figure 2 **Taux de succès SES intégré**

Collecte de données sur les facteurs humains

Les expériences conçues et menées dans le cadre de ce programme pour colliger des données sur les facteurs humains ont produit des données de grande qualité et vérifiables, et elles pourront servir de modèles pour d'autres expériences. Les données obtenues touchent des paramètres d'évacuation relativement simples; mais pour la première fois, des rapports importants ont été cernés entre les paramètres «rendement individuel» et «rendement de groupe».

Application de l'OERR à une étude de cas

L'OERR a été appliqué de façon concluante à une étude de cas fondée sur une analyse de la sécurité de niveau I du Projet énergétique extracôtier de l'île de Sable. La méthode par valeurs ponctuelles et la méthode Monte-Carlo ont toutes deux été utilisées et des analyses de sensibilité détaillées ont été effectuées sur l'effet du changement de configuration des systèmes SES. Les résultats généralement très satisfaisants issus de l'étude de cas sont reproduits au tableau 1.

Élaboration de normes de rendement

Les travaux accomplis dans le cadre du présent projet peuvent servir d'assise au lancement d'un programme d'élaboration de normes de rendement. D'autres recherches devront être effectuées pour l'élaboration de normes destinées à protéger le personnel dans des conditions rigoureuses ou extrêmes, qui caractérisent nombre des situations d'urgence nécessitant le recours à des systèmes SES.

Tableau 1 Résultats de l'application de l'OERR à une étude de cas

RÉSULTATS
Taux de succès élevé, pour autant qu'il existe des itinéraires de rechange menant de tous les points de l'installation aux abris temporaires.
Toutes les simulations donnent des résultats satisfaisants pour des conditions météorologiques calmes, et très mauvais pour des conditions météorologiques extrêmes.
Ce qui compte vraiment, c'est le rendement dans des conditions modérées et rigoureuses.
La combinaison de systèmes autonomes fonctionne mieux que la combinaison de systèmes interdépendants.
La difficulté d'accès à des hélicoptères diminue le taux de succès attendu des évacuations, mais le fait de dépendre totalement d'hélicoptères réduit également le succès de l'évacuation, en raison de l'utilité limitée de ceux-ci dans des conditions météorologiques rigoureuses/extrêmes.
La limite de temps pour l'abandon (secours plus évacuation) est cruciale. Tous les cas de figure sont décevants quand les temps limites pour l'abandon sont très courts.
L'OERR établit clairement le rapport entre le succès d'un système SES et les différentes configurations dudit système.

Recommandations

Recommandations générales

Les travaux décrits dans le rapport final ont mené à la formulation des recommandations générales suivantes :

- Entreprendre sans délai le programme d'élaboration de normes de rendement.
- Poursuivre la recherche sur les systèmes SES, et se pencher notamment sur les facteurs humains et sur les performances des éléments matériels dans des conditions rigoureuses et extrêmes.
- Utiliser les données nouvelles issues des programmes de recherche pour optimiser l'OERR.
- Utiliser l'OERR pour appuyer le programme d'élaboration de normes de rendement.

Recommandations touchant la compilation de données

Les recommandations suivantes se rapportent à la compilation et au classement de données :

- Compiler toute l'information nouvellement répertoriée, y compris celle émanant de bases de données privées et industrielles.
- Continuer à classer les données et à les intégrer à la base de données sur les systèmes SES du CNRC et au site Web en cours d'élaboration.

Développement de l'OERR

Les recommandations suivantes peuvent être formulées en ce qui concerne le développement de l'OERR :

- Poursuivre l'optimisation de l'OERR en le dotant des caractéristiques nécessaires pour répondre aux nouveaux besoins mis en lumière par son utilisation en appui au programme d'élaboration de normes de rendement.
- Au fur et à mesure que s'accumulent les données sur le rendement du système et sur les facteurs humains dans des conditions rigoureuses et extrêmes, modifier la structure de l'OERR, au besoin, et y intégrer les paramètres et facteurs dérivés de ces données.
- Mettre à profit l'OERR dans les travaux d'élaboration des normes.

Données sur les facteurs humains

Des recherches devront être poursuivies sur les thèmes ci-après pour combler les lacunes de l'OERR en ce qui a trait à la simulation du risque et du rendement dans des situations d'accidents et des conditions environnementales extrêmes.

- Facteurs humains dans des conditions extrêmes.
- Effets de l'environnement et d'une situation d'accident sur les facteurs humains dans des conditions modérées à rigoureuses.
- Effets de l'environnement et d'une situation d'accident sur les éléments matériels d'un système EER dans des conditions extrêmes.

Applications de l'OERR

Continuer d'appliquer l'OERR à certaines études de cas, au besoin, afin d'appuyer le programme d'élaboration de normes. L'application de l'OERR à des situations extrêmes qui mettent la vie en danger doit viser d'abord à cerner les lacunes dans les données; il faudra l'utiliser avec prudence jusqu'au moment où la recherche nécessaire pour cerner et quantifier les paramètres appropriés aura été faite et que ceux-ci y auront été intégrés. L'OERR constituera alors la méthode par excellence pour analyser les systèmes SES dans toute la gamme des conditions (accident, effectif et environnement).

Programme d'élaboration de normes de rendement

On trouvera à la figure 3 l'organigramme, pour les deux prochaines années, du programme d'élaboration de normes de rendement. Les grandes étapes du programme sont les suivantes :

- Mise sur pied d'un groupe de travail composé de représentants d'organismes de réglementation et de l'industrie, et de spécialistes des systèmes SES.
- Consultation d'intervenants à l'extérieur du groupe de travail.
- Élaboration de normes de rendement, selon une démarche séquentielle et systématique comportant les étapes suivantes :
  - Définition de la forme et des catégories de normes énumérées à la figure 4.
  - Élaboration d'ébauches de normes (qualitatives).
  - Exécution des recherches nécessaires pour combler les besoins d'information concernant les conditions extrêmes (voir la section *Données sur les facteurs humains*).
  - Élaboration de projets de normes, y compris des seuils quantitatifs applicables aux situations d'urgence présentant différents niveaux de gravité.
  - Élaboration des versions finales de projets de normes.
  - Homologation des normes.
- Mener les recherches connexes nécessaires présentées au tableau 2, pour garantir l'élaboration de normes significatives dans le cas de situations mettant la vie en danger et contre lesquelles elles doivent protéger le personnel.

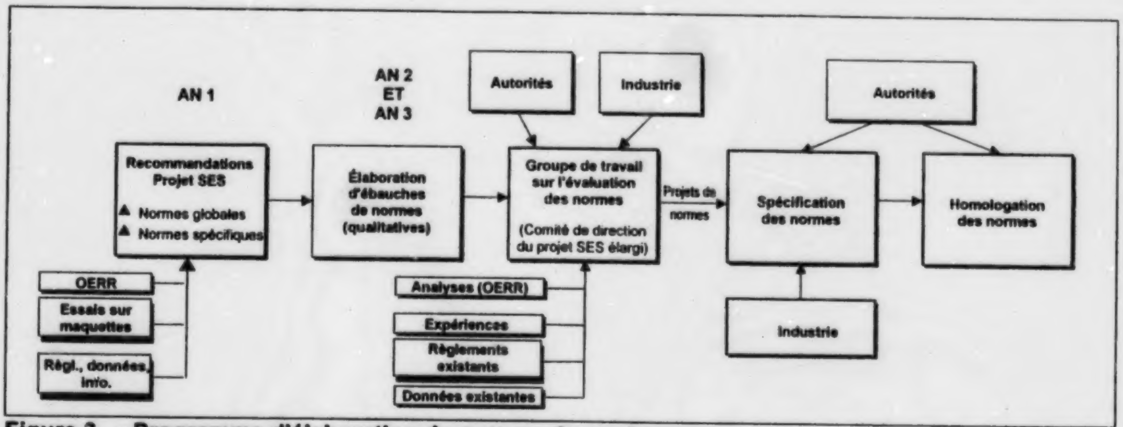
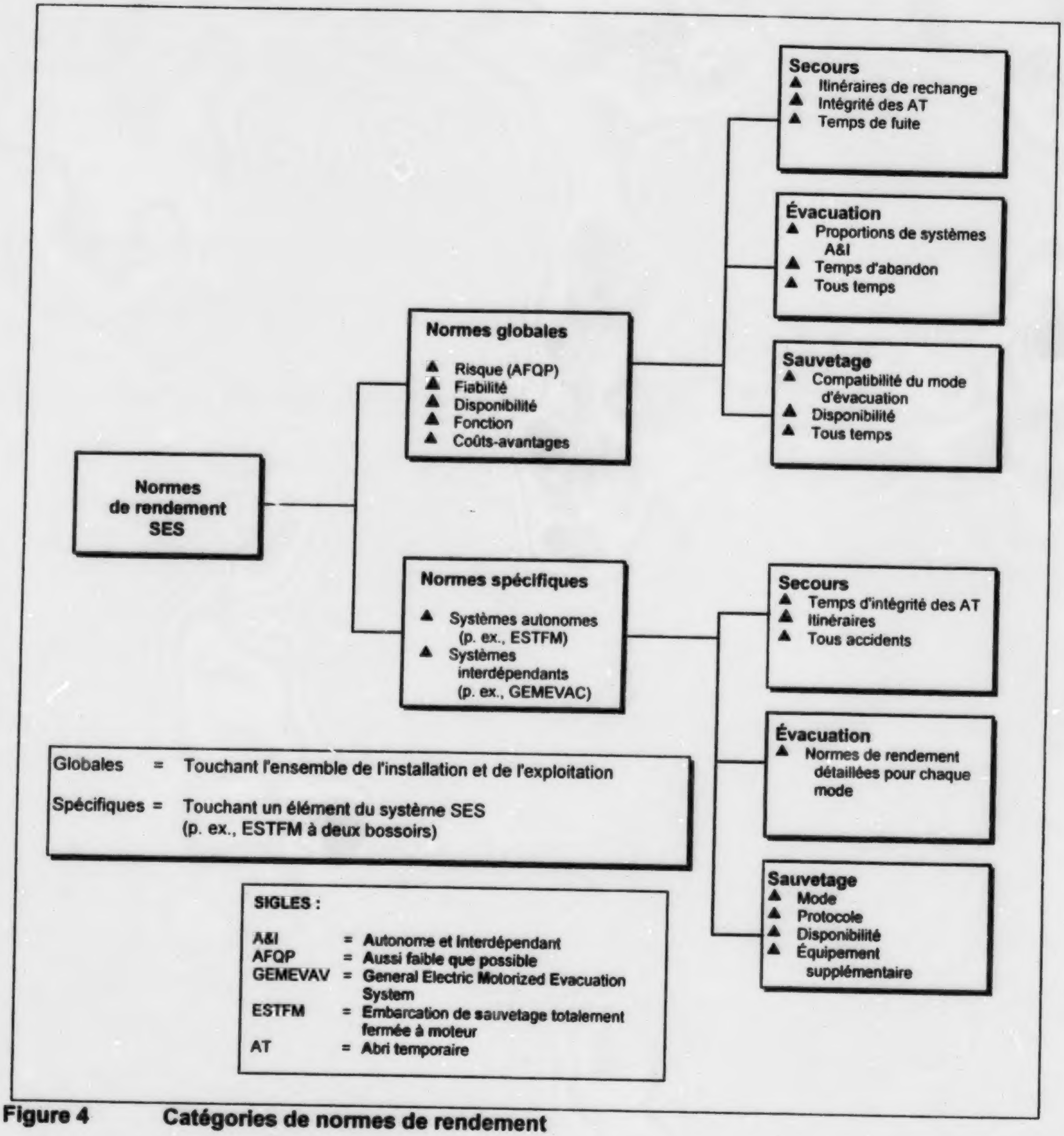

AN 1
AN 2
ET
AN 3
Autorités
Industrie
Autorités
Recommandations
Projet SES
▲ Normes globales
▲ Normes spécifiques
Élaboration
d'ébauches
de normes
(qualitatives)
Groupe de travail
sur l'évaluation
des normes
(Comité de direction
du projet SES élargi)
Projets de
normes
Spécification
des normes
Homologation
des normes
OERR
Essais sur
maquettes
Régl., données,
info.
Analyses (OERR)
Expériences
Règlements
existants
Données existantes
Industrie

Figure 3 - Programme d'élaboration de normes de rendement


Normes de rendement SES
Normes globales
▲ Risque (AFQP)
▲ Fiabilité
▲ Disponibilité
▲ Fonction
▲ Coûts-avantages
Secours
▲ Itinéraires de rechange
▲ Intégrité des AT
▲ Temps de fuite
Évacuation
▲ Proportions de systèmes A&I
▲ Temps d'abandon
▲ Tous temps
Sauvetage
▲ Compatibilité du mode d'évacuation
▲ Disponibilité
▲ Tous temps
Normes spécifiques
▲ Systèmes autonomes (p. ex., ESTFM)
▲ Systèmes interdépendants (p. ex., GEMEVAC)
Secours
▲ Temps d'intégrité des AT
▲ Itinéraires
▲ Tous accidents
Évacuation
▲ Normes de rendement détaillées pour chaque mode
Sauvetage
▲ Mode
▲ Protocole
▲ Disponibilité
▲ Équipement supplémentaire

Globales = Touchant l'ensemble de l'installation et de l'exploitation

Spécifiques = Touchant un élément du système SES (p. ex., ESTFM à deux bossoirs)

SIGLES :

A&I = Autonome et Interdépendant
AFQP = Aussi faible que possible
GEMEVAV = General Electric Motorized Evacuation System
ESTFM = Embarcation de sauvetage totalement fermée à moteur
AT = Abri temporaire

Figure 4 Catégories de normes de rendement

Tableau 2 **Recherches SES à mener à l'appui de l'élaboration de normes**

N°	SECTEUR DE RECHERCHE
1	Facteurs humains dans des conditions extrêmes
2	Effets d'une situation d'accident et de conditions environnementales modérées et rigoureuses sur les facteurs humains
3	Effets des conditions environnementales et d'une situation d'accident sur la fiabilité des éléments matériels d'un système SES
4	Compilation de données supplémentaires
5	Visites de sites et formation
6	Planification détaillée d'expériences
7	Intégration des nouvelles données à l'OERR

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GLOSSARY

A&I	Autonomous and Interdependent
Abandonment	Escape and evacuation
ALARP	As Low As Reasonably Practicable
API	American Petroleum Institute
CAA	Civil Aviation Authority
CDF	Cumulative Distribution Function
CE	Concept Evaluation
Consequence	The direct effect of an accidental event.
EER	Escape, Evacuation, and Rescue. The process of personnel at an offshore installation transferring from their location at the time of an evacuation alarm to a safe haven such as a standby vessel or search and rescue helicopter.
Error Rate	Probability of making a wrong decision or taking a wrong action in a given situation or per demand
Escape	The process of personnel at an offshore installation transferring from their location to the temporary refuge or muster point, starting from the time an evacuation alarm sounds
Evacuation	The process of personnel at an offshore installation transferring from the temporary refuge or muster point to a location clear of the platform where they can be rescued
Failure	In the context of EER, a specific procedure (such as evacuation) that directly results in one or more fatalities. Such fatalities do not include occupational accidents (such as falls on a stairway) or natural causes (such as a heart attack), which may occur during the procedure.
Failure Rate	Probability of carrying out an action incorrectly in a given situation or activity
Fatality Rate	Probability of fatality in a given potentially fatal incident or event
FPSO	Floating Production Storage and Offloading
FRC	Fast Rescue Craft
FSU	Floating Storage Unit
GBS	Gravity-Based Structure
Gemevac	General Electric Motorized Evacuation System
GRP	Glass Fibre-Reinforced Polyester

Hazard	A condition with a potential to create risks such as accidental leakage of natural gas from a pressurized vessel
HAZID	Hazard Identification
HAZOP	Hazard and Operability analysis
HF	Human Factors, including human performance in different situations
HSE	Health and Safety Executive
IMD	Institute for Marine Dynamics
IRT	Ice Resistant TEMPSC
MCRPT	Monte Carlo Risk and Performance Tool
MEG	Monoethylene Glycol
MMS	Minerals Management Service
MOB	Man Overboard
Monte Carlo	A numerical method for evaluating combinations of statistical distributions
NFPA	National Fire Protection Association
NGL	Natural Gas Liquids
NPD	Norwegian Petroleum Directorate
NRC	National Research Council Canada
ODELE	Offshore Dry Evacuation Lifesaving Equipment
OIM	Offshore Installation Manager
PDF	Probability Distribution Function
PLL	Probable Loss of Life
POB	Persons on Board
PROD	Preferred Orientation and Displacement
QRA	Quantitative Risk Assessment
Rescue	The process of transferring offshore installation personnel from a location clear of the platform, generally in a lifeboat on the ocean, to a safe haven such as a standby vessel or search and rescue helicopter
Risk	A compound measure of the probability and magnitude of adverse effect
RPO	Relative Probability of Occurrence
RPT	Risk and Performance Tool

SAR	Search and Rescue
SBV	Standby Vessel
SCAT	Survival Craft Anchored Tow
Skyscape	An evacuation system based on an enclosed series of slides to evacuate from deck level to a raft at sea level
SOEP	Sable Offshore Energy Project
SOLAS	Safety of Life at Sea
Success	In the context of EER, a specific procedure (such as evacuation) that does not incur any fatalities as a direct result of that procedure. Such fatalities do not include occupational accidents (such as falls on a stairway) or natural causes (such as heart attacks), which may occur during the procedure.
TDC	Transportation Development Centre of Transport Canada
TOES	TEMPSC Orientation and Evacuation System
TR	Temporary Refuge, sometimes called Temporary Safe Refuge (TSR)
TSR	Temporary Safe Refuge, sometimes called Temporary Refuge (TR)
TEMPSC	Totally Enclosed Motor Propelled Survival Craft
UKCS	United Kingdom Continental Shelf
UKOOA	United Kingdom Offshore Operators Association

1. INTRODUCTION AND BACKGROUND

1.1 General Introduction

This final report describes the work conducted and summarizes the results for the Escape, Evacuation, and Rescue (EER) Research Project commenced on January 1, 2000, and substantially completed as described in this report.

The project consisted of a multifaceted approach to the development of performance-based standards of the EER process for offshore installations off the East Coast of Canada. Generally, the work consisted of data and literature compilation, development of a computerized simulator applicable to the evaluation of the EER process and its components, validation of the Risk and Performance Tool (RPT) by comparison with available data, application of the RPT to a case study and illustration of its applicability through sensitivity analyses, use of the results of the application as a guideline for the development of performance-based EER standards, recommendations on a program for the further advancement of the development of EER performance-based standards, and a series of progress reports [6, 7, 8, 9][*] and meetings [4, 5] together with stakeholder consultations and this final report.

1.2 Objectives

The objective of this study was to develop a prioritized and focused R&D program specific to EER, which would lead to the implementation of performance-based EER standards or guidelines for the offshore industry. The results of this work will provide an RPT and the rationale for regulative authorities to evaluate design standards for EER systems employed in the offshore industry. The performance-based standards will address all relevant human factors (HF) and technical performance with respect to the usability of the systems.

1.3 Statement of Work

1.3.1 Summary of Statement of Work

Table 1.1 summarizes the principal tasks, together with the associated administrative milestones, deliverables, completion dates, and references in this report. The work consisted of the following principal tasks:

- Task 1 – Detailed Plan
- Task 2 – Data and Literature Compilation
- Task 3 – RPT Development
- Task 4 – RPT Validation and Application
- Task 5 – Recommendations on Critical R&D Areas or Issues
- Task 6 – Reporting

The general relationship and workflow among these tasks is shown in Figure 1.1.

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[*] Numbers in square brackets correspond to publications listed in References.

Table 1.1 **Summary of tasks, completion date, and report location**

MILESTONE	*TASK* – DELIVERABLE	DATE	REFERENCE
1	***Task 1*** – Detailed Plan	January 31, 2000	1.3
2	***Task 2*** – Literature and Data Search as Progress Report #1 ***Task 2.1*** – Worldwide EER Literature	March 31, 2000	2.2
3	***Task 2.2*** – East Coast Marine Drill Data and Safety Experiment Compilation	March 31, 2000	2.3
4	***Task 2.3*** – East Coast Fixed Installation EER Data	March 31, 2000	2.4
5	***Task 2.4*** – North Sea EER Data Compilation and Analysis	March 31, 2000	2.5
6	***Task 3*** – RPT Development ***Task 3.1*** – Preliminary Software Package for the RPT	March 31, 2000	3.1
7	***Task 3.3*** – RPT Monte Carlo Capability	March 31, 2000	3.3
8	***Task 3.2*** – EER RPT Development as Progress Report #3	August 31, 2000	3.4
9	***Task 4*** – RPT Validation and Application ***Task 4.1*** – EER RPT Ground Truth and Application	February 21, 2001	3.5, Chapter 5
10	***Task 4.2*** – Integration and Analysis of HF Data into EER Model and Progress Report #3	November 30, 2000	3.5
11	***Task 4.3*** –Skyscape Drill and Simulated Emergency	November 30, 2000	4.2, 4.4
12	***Task 4.4*** – Winter Environment Effects on EER HF	March 15, 2001	4.3, 4.4
13	***Task 4.5*** – Planning of Model and Full-Scale EER Experiments, Part 1	March 15, 2001	7.3
14	***Task 4.6*** – PROD Data Compilation and Analysis, Part 1	March 15, 2001	2.6
15	Administrative Item	March 15, 2001	-
16	***Task 5*** – Recommendations on Critical R&D areas or issues ***Task 5.1*** – Recommendations on Critical R&D areas or issues and Progress Report #4	March 15, 2001	Chapters 6 and 7
17	***Task 5.2*** – Performance-Based Guidelines in UK	March 15, 2001	6.2
18	***Task 6*** – Reporting ***Task 6.1*** – Draft Final Report ***Task 6.2*** – Final Report	March 31, 2001 May 31, 2001 *June 19, 2001*	References [6, 7, 8, 9]

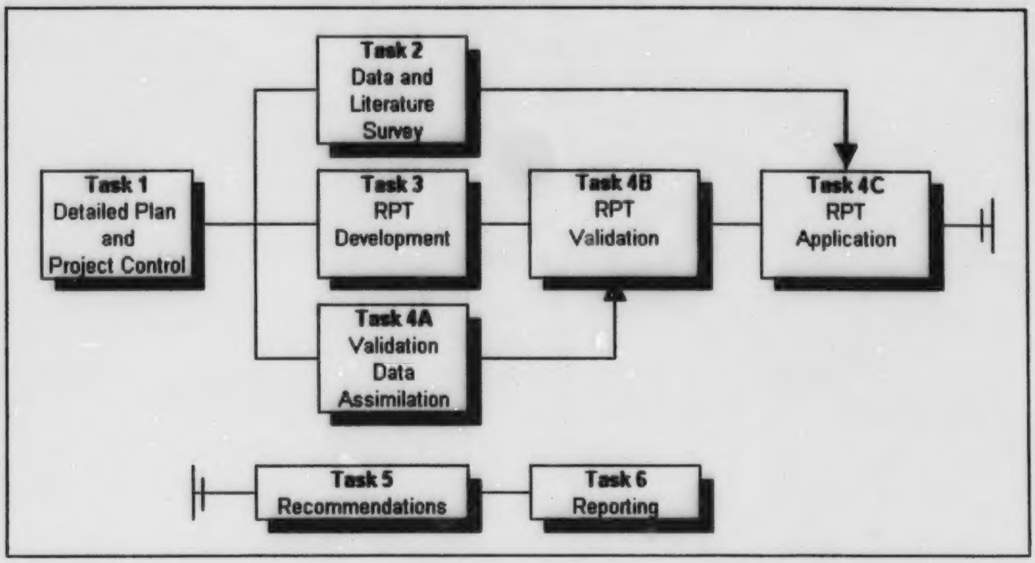

Task 2
Data and Literature Survey
Task 1
Detailed Plan and Project Control
Task 3
RPT Development
Task 4B
RPT Validation
Task 4C
RPT Application
Task 4A
Validation Data Assimilation
Task 5
Recommendations
Task 6
Reporting

Figure 1.1 Workflow for the project

1.3.2 Detailed Statement of Work

The detailed statement of work, including the subdivision of each of the main tasks into subtasks and details thereof, may be described as follows:

- **Task 1 – Detailed Plan**
  - (a) Detailed plan and milestones.
  - (b) Conference call among Steering Committee and Project Management.
  - (c) Calls among Subcontractor Lead Personnel and Project Manager.
  - (d) Kick-Off Meeting – Progress Meeting #0.

- **Task 2 – Worldwide EER Literature and Data Search**
  - **Tasks 2.1, 2.2, 2.3, and 2.4**
    - (a) Worldwide EER literature and data search including online search, institutional and private libraries, principal East Coast operators (SOEP, Terra Nova, Hibernia), and principal government and private agencies. Information to cover the following:
      - Existing EER systems;
      - EER systems undergoing development;
      - EER systems in conceptual stage;
      - HF performance, survival, error, parameters.
    - (b) Provision of findings as an Excel listing.
    - (c) East Coast marine data.
    - (d) North Sea data.
    - (e) Summary report on findings.

- **Task 3 – EER Risk and Performance Tool Development**
  - **Task 3.1 – Preliminary Software Package for the RPT**
    - (a) Definition of principal RPT features necessary to accomplish the task.
    - (b) Extraction of necessary RPT features from the Bercha Probabilistic Escape and Evacuation Risk Simulator to form a purpose-specific probabilistic model.
    - (c) Development of reliability-based input data for RPT.
    - (d) Development of human factors input data for RPT.
    - (e) Function validation for the newly developed RPT model.
    - (f) Escape modelling using RPT.
    - (g) Evacuation modelling using RPT.
    - (h) Rescue modelling using RPT.
    - (i) Integrated EER assessment using RPT.
    - (j) Progress Meeting #1 (Halifax).

- **Task 3.2 – EER RPT Development**
  - (a) Refinement of reliability, HF, and situational dependence of inputs and their statistical measures.

(b) Integration of expected value and Monte Carlo RPTs into one software package.
(c) Documentation and manual.
(d) Progress Meeting #2 (Calgary).

- **Task 3.3 – Monte Carlo Capability RPT**
  (a) Selection of key distributive input and output variables.
  (b) Expansion of RPT to include provision for distributive input and output variables (proposed in triangular distribution format).
  (c) Integration of @RISK Monte Carlo package into RPT.
  (d) Function testing of software.
  (e) Documentation and manual – preliminary outline.

- **Task 4 – RPT Validation and Application**
  - **Task 4.1 – EER RPT Ground Truth and Application**
    (a) Compilation of ground-truth data for lifeboat-based and chute-based systems.
    (b) Compilation of input data for RPT.
    (c) Modelling of lifeboat-based EER processes using RPT.
    (d) Comparison of RPT results with performance data for each of the categories of scenarios.
    (e) Generation of modifications and adjustments to RPT as required on the basis of comparison.
    (f) Validation of RPT using probabilistic escape, evacuation, and rescue simulator in Monte Carlo mode to determine where RPT results fall on the probability distribution.
    (g) Progress Meeting #2 (Calgary).
    (h) Application of RPT to several applicable evacuation procedures together with weather scenarios in a case study.
    (i) Performance of sensitivity runs to evaluate EER effects of different configurations.
    (j) Analysis and organization of the data from the EER runs.

  - **Task 4.2 – Integration and Analysis of HF Data into EER Model**
    (a) Design of Skyscape and other HF experiments.
    (b) Following Skyscape experiment in Task 4.3, analysis and integration of Skyscape experiment results into model.
    (c) Compilation of other relevant public domain HF data in possession of Survival Systems.
    (d) Acquisition of necessary instrumentation including laptop computer and timecode generator, video system, and digital cameras.

  - **Task 4.3 –Skyscape Drill and Simulated Emergency**
    (a) Detailed design and scheduling of full-scale experiment.
    (b) Final preparations including documentation, instrumentation, timing.
    (c) Execution of drill and simulated emergency for Skyscape.

  - (d) Analysis of experiment results and their integration into the RPT model.
  - (e) Generation of recommendations for improvement of future full-scale simulations and their predictive applicability.

- **Task 4.4 – Winter Environment Effects on EER HR**
  - (a) Planning of HF experiments for winter conditions.
  - (b) Conduct of experiments.
  - (c) Data analysis.

- **Task 4.5 – Planning of Model and Full-Scale EER Experiments, Part 1**
  - (a) Definition of research provisions to support development of performance-based EER standards.
  - (b) Detailed planning of model (with IMD) and full-scale HF experiments and other research.

- **Task 4.6 – PROD Data Compilation and Analysis, Part 1**
  - (a) Compilation of full-scale preferred orientation and displacement (PROD) trial data.
  - (b) Preliminary analysis of PROD data for simulation and reliability parameters.

- **Task 5 – Recommendations on Critical R&D Areas or Issues**
  - (a) Definition of key issues for further research, including HF.
  - (b) Recommendation of optimal development program for performance-based EER standards.

- **Task 6 – Reporting**
  - (a) Progress reporting for each principal task.
  - (b) Draft Final Report following completion of Task 5 and presentation meeting in Ottawa.
  - (c) Final Report within six weeks of Draft Final Report.

1.4 Outline of Report

The report has been organized in accordance with the flow of work as described in the statement of work. Thus, following this brief introduction, Chapter 2 describes the literature and data compilation activities, Chapter 3 describes the development program for the risk and performance tool, Chapter 4 describes the human factors experiments necessary to generate data for HF requirements of the RPT, Chapter 5 describes the RPT application to a case study, and Chapter 6 gives recommendations on a development program for performance-based standards evolving from the work described. Chapter 7 summarizes conclusions and recommendations. Appendix A provides further details on the literature and data reviewed as part of Task 2.

2. LITERATURE AND DATA COMPILATION

2.1 General Introduction

The scope of work covered by this chapter includes the following subtasks under Task 2 of the EER research project:

Task 2.1	Worldwide EER data and literature compilation.
Task 2.2	East Coast marine drill data and emergency equipment specification compilation and analysis.
Task 2.3	East Coast fixed installation emergency drill data and information compilation.
Task 2.4	North Sea EER data compilation and analysis.
Task 4.6	PROD data compilation.

This chapter generally describes and illustrates the data compiled with particular emphasis on evacuation systems in Section 2.6, while Appendix A gives detailed descriptions.

2.2 Worldwide EER Data and Literature Search

2.2.1 Description of Work

A worldwide EER literature and data search was conducted. Principal sources included the Internet, institutional and private libraries, and industry contacts. The results were compiled in both hardcopy format (see Appendix A), and in electronic format in Microsoft Excel 7, as agreed by the Steering Committee.

Essentially, the search included online searches, online activity, physical visits to institutional libraries, telephone calls, and personal contacts. The format was a basic database in Microsoft Excel 7 with the following fields:

- Reference Number
- Author
- Title/Report Number
- Code (identifying the general category in accordance with those described in Section 2.2.3)
- Date
- Place of Issue
- Number of Pages
- Summary/Subject
- Form (book, brochure, videotape, etc.)
- Physical Location
- Class (for future use if circulation restrictions apply), e.g., "U" means unr

2.2.2 Data Sources

The principal categories of data sources included institutions, manufacturers, operators, service consultants, and classification organizations. Table 2.1 summarizes some of the sources used under each of these general categories of sources. This is not a complete list, which is contained in the database itself.

2.2.3 Sample Search Results

Regulatory information

Table 2.2 provides examples of typical regulatory data listings collected in the data search. More than 100 similar listings are included in the database.

Accident information

Table 2.3 summarizes six entries from the accident information category in the database. As can be seen, they range from video and formal reports of the Ocean Ranger to a variety of individual marine accident accounts.

Escape information

Table 2.4 summarizes the various data on escape from installations in both marine and onshore environments. They range from specific escape route characterization for offshore installations to more general computer modelling of escape routes in accidental fire situations.

Evacuation information

Table 2.5 gives examples of evacuation information listings from the database. They range from listings describing systems under development to documentation of specific operation systems.

Rescue information

Table 2.6 lists representative entries in the database under the category of rescue. These cover specific rescue systems, consideration of human factors including hypothermia, official case studies, industry guidelines, and developmental rescue systems.

Integrated EER information

Table 2.7 includes samples of entries dealing with the entire process of EER. They range from operational aspects, through computer modelling, to specific rescue mode applications.

Human factors information

Table 2.8 provides a selection of listings under the human factors category ranging from human behaviour studies for emergency situations to survival at sea, and includes both industry publications and scientific papers.

Preparedness (maintenance, drills, and training)

Table 2.9 contains selected listings from the preparedness category. They range from recommendations on training programs to video recordings on safety enhancement.

East Coast information

Table 2.10 lists selected entries from the East Coast category in the database. These range from descriptions of the operations off the East Coast to detailed modelling procedures applicable to East Coast installations. It should be noted that additional East Coast data, both for drills and for equipment specifications, is dealt with in Chapter 3.

North Sea information

Table 2.11 lists data entries under the North Sea category, which covers both the North Sea and the Northern Sea Routes. Entries range from actual voyage and operation descriptions to computer simulation of operations.

Table 2.1 Data sources

Institutions - Canada	• Atmospheric Environment Service • Bedford Institute of Oceanography • Canada Oil and Gas Lands Administration • Canadian Centre for Climate Modelling and Analysis • Canadian Coast Guard • Canadian General Standards Board • Canadian Marine Transportation Centre • Canada-Newfoundland Offshore Petroleum Board • Department of Public Works and Government Services Canada • Environment Canada • Environmental Studies Revolving Funds • Federal Panel on Energy Research and Development • Government of Canada • Industry Canada • Institute for Marine Dynamics • National Energy Board • National Research Council of Canada • Natural Resources Canada • Transportation Safety Board of Canada
Institutions - International	• American Petroleum Institute • Department of Trade and Industry, United Kingdom • Department of the Interior (USA) • Her Majesty's Stationery Office • HSE Offshore Safety Division • International Maritime Organization • International Organization for Standardization • Minerals Management Service (USA) • Royal Institution of Naval Architects • Scott Polar Research Institute • United States Coast Guard
Manufacturers	• Dacon • DBC Marine Safety Systems Ltd. • Helly Hansen • Multifabs Survival Ltd. • Safeguard Technology • Schat-Harding • Texas Engineering Extension Service for Training and Safety
Operators	• Sable Offshore Energy Project • Shell
Libraries	• Cambridge University Library • Library of Parliament, Canada • Memorial University Library • University of Alberta Library • University of Calgary Library
Service Consultants	• Bercha Group • Consafe Engineering (UK) Limited • Fleet Technology Limited • Ian M. Doig & Associates Ltd. • Marine Management (Holdings) Ltd. • Micromedia Ltd. • Moxie Media Inc. • Primatech, Inc. • RGIT Limited Centre for Health and Safety Sciences
Classification Organizations	• American Bureau of Shipping • American Meteorological Society • American Society of Safety Engineers • Det Norske Veritas • Lloyd's Register of Shipping

Table 2.2 Typical regulatory data

Ref. #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
287	.	Principles and procedures for classification of offshore installations.	r	Det Norske Veritas AS	1985	Norway	unavail.	.	book	NEB TC1665/P7	U
340	.	Regulations respecting the safety of diving operations conducted in connection with the exploration or drilling for or the production, conservation, processing or transportation of oil or gas. *Short title: Canada oil and gas diving regulations.*	r	Minister of Supply and Services Canada	1989	Ottawa	79	Summary - Application: These regulations apply to any diving operation carried on in connection with the exploration or drilling for or the production, conservation, processing or transportation of oil or gas in areas which the Act applies.	gov't docs	NEB V.F. Canada. Canada Oil and Gas Diving Regulations	U
230	.	Nova Scotia offshore certificate of fitness regulations.	r	Queen's Printer	1995	Ottawa	unavail.	Subjects: Offshore oil industry - Law and legislation - Canada Offshore oil industry - Law and legislation - Nova Scotia Natural gas Law and legislation - Canada Natural gas - Law and legislation - Nova Scotia Petroleum - Taxation - Canada Petroleum - Taxation - Nova Scotia Marine mineral resources - Law and legislation - Canada Marine mineral resources - Law and legislation - Nova Scotia	gov't docs	NEB V.F. Canada-Nova Scotia Offshore Petroleum	U
1	International Maritime Organization	International Life-Saving Appliance Code (LSA Code).	r	International Maritime Organization	1997	London	55	Summary: The International Life-Saving Appliance (LSA) Code was adopted by the Maritime Safety Committee (MSC) at its 66th session (June 1996) by resolution MSC.48(66), in order to provide international standards for the life-saving appliances required by chapter III of the 1974 SOLAS Convention. The Code was made mandatory under SOLAS by amendments to the Convention adopted by the MSCat the same session (res. MSC.47(66)). The amendments are expected to enter into force on 1 July 1998.	book	Bercha	U
12	International Maritime Organization	SOLAS - International Convention for the Safety of Life at Sea, 1974 Resolutions of the 1997 SOLAS Conference relating to bulk carrier safety.	r	International Maritime Organization	1999	London	63	Summary: The remaining resolutions of the 1997 SOLAS Conference are included in this publication. Among other things, they include amendments to the Guidelines on the enhanced program of inspections during surveys of bulk carriers and oil tankers (resolution A.744(18), as previously amended by resolution MSC.49(66), which are mandatory under regulation XI/2 of the Convention.	book	Bercha	U
548	Marine Safety Directorate (Canada), Transport Canada - Safety and Security (Canada)	Marine Safety Review.	r	Marine Safety Directorate of Transport Canada	1997	Ottawa, ON	unavail.	Subject: Navigation, Canada, safety measures, periodicals, Merchant marine, ships, safety regulations	periodical	UofC VK200 .M37	U

Table 2.3 Typical accident data

Ref. #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
315	.	Report one and two / Royal Commission on the Ocean Ranger Marine Disaster.	a	Royal Commission on the Ocean Ranger Marine Disaster	1984-85	St. John's, Nfld.	vol. 1 400; vol.2 308; vol.3 189	Summary: *Report One* - The primary purpose of this report is to set forth the results of the inquiry of the Royal Commission into the loss of the Ocean Ranger and its crew. This inquiry has addressed three basic questions: Why did the Ocean Ranger capsize and sink? Why was none of the crew saved? How can other similar disasters be avoided? This report will provide an answer to the first two questions and an initial response to the third. A broad investigation has been launched into this third area to identify practical means of improving human safety during drilling operations off the east coast of Canada. *Report Two* - this final report presents the results of investigation into the third area, the goal of which was to identify ways and means of improving human safety during exploratory and delineation drilling operations off eastern Canada. *Report Two Volume Three* - Summaries of the seminar proceedings and of selected study reports are included in this volume.	report	NEB TN871.3/R69 /1984-85	U
224	Fischer, David W.	Managing technological accidents: Two blowouts in the North Sea: incorporating the proceedings of an IIASA Workshop on Blowout Management, April 1978.	a	Pergamon Press	1982	England	234	Summary: The proceedings of an IIASA Workshop on blowout management with focus on two blowouts in the North Sea. This book describes the system within which blowouts occurred and summarizes post-1977 thinking by both the oil industry and its government regulators. It does not attempt to find fault with either industry or government; nor does it provide a technical description of the two blowouts that occurred. Rather, it aims to place the blowouts in the larger framework of disaster management. This means that blowouts are viewed as examples of an important man-technology interface with a potential for disastrous consequences, thus demanding a broad range of management skills.	workshop proceedings	NEB TN871.2/M35	U
542	House, J.D.	But who cares now?: The tragedy of the Ocean Ranger.	a	Breakwater	1987	St. John's, Nfld.	94	Subject: Ocean Ranger, drilling platforms, accidents, marine accidents, social aspects, Newfoundland.	book	UofC TN871.3 .H68	U
198	OREDA	OREDA-92 handbook 2nd edition offshore reliability data.	a	OREDA Participants	1992	Norway	unavail.	Summary: The OREDA-92 handbook will give a unique data source on failure rates, failure mode distribution and repair times for equipment used in offshore development. These data are necessary for reliability as well as risk analyses. Possible applications are: reliability, availability, and maintainability (RAM) analyses and regularity studies, risk analyses, planning and scheduling of maintenance, inspection and testing, cost benefit studies and selection of alternative system designs.	book	Bercha	U
151	Tambobskiy, K and Suslin, M.	Anatomy of accidents. (Russian)	a	Morskoy Flot	1990, Oct.	unavail.	14-15	Summary: Examines nature of shipping accidents on Northern Sea Route since 1969 and analyses causes. Mentions examples of accidents and notes considerable increase in accidents in autumn and winter periods.	periodical	SPRI	U
222	WOAD	WOAD statistical report 1996: statistics on accidents to offshore units engaged in oil and gas activities world-wide in the period 1970-95.	a	Det Norske Veritas AS	1996	Norway	unavail.	Subjects: Offshore structures - accidents - Statistics Marine Accidents - Statistics.	report	NEB TC1665/W62 /1996	U

Table 2.4 Typical escape data

Ref. #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
764	Offshore Technology	EM&I Safety - Escape systems for the offshore industry.	es	Offshore Technology	unavail.	UK	3	Summary: EM&I Safety provides a complete safety advisory service for planning of safety integrity management systems through to the design and commissioning of these systems both offshore and onshore. Principle products include the DONUT personal safety device and the TOES TEMPSC Orientation and Evacuation System.	world wide web	EM&I	U
557	Shields, Silcock & Dunlop	A methodology for the determination of code equivalency with respect to the provision of means of escape.	es	Fire Safety Journal	1992	unavail.	unavail.	.	journal	USCG	U
448	.	Assessment of the means for escape and survival in offshore exploration drilling operations.	es	.	1984	.	unavail.	.	book	C-NOPB VK1255O3R 62 Escape 1984	U
709	.	Looking for a variety of platform escape methods.	es	Offshore Engineer	1988, Oct.	unavail.	unavail.	Subject: Surescue, LORS, PROD, Power.	periodical	DNV	U
556	Cooper, L.Y.	A mathematical model for estimating available safe egress time in fires.	es	Fire and Materials, Vol. 6, Nos. 3 & 4	1982	unavail.	unavail.	.	journal	USCG	U
193	Hewitt, Ian	Analysing smoke and toxic gas hazards: preventing ingress into TSRs.	es	British Gas Exploration & Production	1992	UK	31	Summary: This paper describes the physiological effect of smoke and gas from fires on offshore platforms. The probabilities of smoke and toxic gas under credible scenarios are assessed and recommendations are made to mitigate against their ingress into the TSR.	report	Bercha	U

Table 2.5 Typical evacuation data

Ref. #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
757	.	The development of an easily recovered liferaft. Report No. I4446.C, March 1997 (draft). Prepared for the Transportation Development Centre (TDC). TP 1304IE	ev	Fleet Technology Limited (FTL)	1987	Canada	unavail.	Summary: An investigation was undertaken into methods to improve the recovery of occupied SOLAS (Safety Of Life At Sea) liferafts by Search and Rescue SAR vessels. The work involved a review of previous R&D research on liferaft recovery methods and associated problems, and the establishment of performance and design constraints for direct recovery of an occupied raft. The report concludes that the modified raft and recovery system will successfully recover a fully loaded 16 person liferaft in high sea states in less than two minutes, and that the promise shown warrants further evaluation, development of a liferaft retrieval mechanism, and exposure of the ideas to the SAR community.	report	FTL	U
303	.	The evaluation of surface evacuation procedures for a ditched helicopter: Phase II.	ev	NEB	1996 / 1998 (Mfiche)	Calgary, Alta.	36	Summary: Following the recommendations outlined in Phase I experiment (see PERD Report 200-9, July 1995), which was conducted under calm conditions, in Phase II, 24 male and 19 female subjects conducted a series of evacuations from Norwegian Underwater Technology Centre's (Nutec) Super Puma Helicopter Simulator during more severe sea state conditions. Dry evacuations were compared to wet evacuations using two different types of aviation liferafts (canopy & non-canopy) on both the windward and leeward sides. The results indicate that the preferred method of evacuation is the dry method, on the windward side using a non-canopy liferaft.	report / Mfiche	report: NEB TA 7/F43/no.17, *Microfiche:* NEB TA 7/F43/no.17 Mfiche	U
190	Det Norske Veritas Industry AS	DNV Harding Safety A/S Technical Report. Selection of evacuation means for offshore installations. Report NR. 45212048	ev	Det Norske Veritas Industry AS	1995	Norway	34	Summary: This report draws together the results of many risk and EER studies of offshore installations. The importance of the evacuation system is emphasized. Key success factors for safe evacuation is described. The report contains guidelines on how to select optimal evacuation means for a given installation under the constraints of regulations, minimum requirements for efficiency of evacuation and cost-benefit. A quick method for cost-benefit evaluation of evacuation means is given. The method can also be used to compare investments in the evacuation systems against alternative safety measures.	report	Bercha	U
17	DNV Consultancy Services Johan Polgieter	Literature Review of Offshore Platform Sea Evacuation Systems prepared for Sable Offshore Energy Project 2663.	ev	DNV Consultancy Services	1997, June	Canada	19	Summary: Scope of Work: This review considers general escape and evacuation methods for potential application to the SOEP Thebaud PUQ & Wellhead Platforms, Venture Wellhead Platform and North Triumph Satellite Platform. The study is concerned with primary evacuation methods i.e. lifeboat based systems, mass evacuation systems and personnel escape systems. Review of precautionary evacuation systems (helicopters) whilst referenced is outside the scope of this review as is rescue and retrieval of personnel.	report	Bercha	U
15	Magellan Jacques Whitford	Criteria for the assessment and selection of Enhanced Evacuation Systems: A framework for continuous improvement for Natural Resources Canada.	ev	Magellan Jacques Whitford	1999, March	Canada	40	Summary: The aim of this research is to propose a methodology that will allow operators, regulators, and contractors to assess and select arrangements for escape, evacuation and rescue for offshore installations operating in Canada. The results of this research were obtained through literature review, consultation and a specialist team review of existing assessment methods.	report	Bercha	U
772	Mills, F., Coleshaw, S.R.K.	Evacuation and casualties using Freefall TEMPSC.	ev	Centre for Health and Safety Sciences, RGIT Limited	unavail.	Aberdeen	9	Summary: This paper deals with issues such as stretcher handling, generic methods of triage and the transportation and security of casualties within freefall lifeboats. Recommendations have been made to help develop harmonized procedures for the offshore industry.	world wide web	RGIT	U

Table 2.6 Typical rescue data

Ref. #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
760	.	Rescue frame: Manual recovery equipment for rescuing craft. Rescue scoop: Powered recovery system for rescue vessels, Dacon.	re	Dacon	unavail.	unavail.	13	Summary: The Dacon Rescue Scoop is a manoeuvrable rescue "net" operated by a standard deck crane for the recovery of casualties from the water directly on board rescue vessels. Drawings are also provided.	information booklet and drawings	Dacon	U
25	Laitinen, L.A.	Cold water rescue In: Rey, Louis, ed. Arctic underwater operations; medical and operational aspects of diving activities in Arctic conditions.	re	Graham and Trotman	1985	London	139-144	Summary: Considers factors affecting survival times in cold water and strategies for preventing hypothermia. Describes organization of sea rescue operations in Finland.	book	SPRIShelf(*2):6 26.02	U
454	McGimpsey, Len and Timmins, Doug	1992 Report of the Auditor General - Chapter 8 - Main Points Search and Rescue.	re	Her Majesty the Queen Right of Canada	1992	Canada	17	Summary: This is the 1992 report of the Auditor General of Canada which covers the main points of search and rescue. The report covers the following: audit scope and criteria, observations, previously proposed solutions have not been fully implemented, significant elements of a National Search and Rescue program have not been developed, service standards are lacking, opportunities exist to improve program delivery, Federal search and rescue resources do not perform the rescue in most distress incidents, expanded use of volunteer and other resources should be pursued, the provision of search and rescue service with patrol vessels requires re-examination, more use of other federal resources for search and rescue is possible, performance information is lacking, analysis of the causes of beacon failures and false alarms is required, information is needed on small boat activities and cost recovery possibilities exist.	report	Office of the Auditor General of Canada and the Commissioner of the Environment and Sustainable Development	U
505	Moxie Media Inc.	"Man overboard prevention for inland waterways & maritime personnel."	re	Moxie Media Inc.	unavail.	New Orleans, La	unavail.	Summary: This program explores the causes of man overboard accidents and the inland waterways and their deadly effects. Utilizing the joint recommendations of a recent AWO/ Coast Guard report, this video focuses on prevention and integrating a culture of shipboard safety. Recovery techniques, treatment of hypothermia and safe work practices are all demonstrated. (24 min).	video	Moxie Media Inc. (IW-ManOv5)	For Sale
213	Simoes Re, Antonio J.	Evaluation of GBS based, Fast Rescue Craft launch and retrieval.	re	IMD (NRC)	1993	Canada	unavail.	Summary: A brief evaluation of the motions and accelerations experienced by a Fast Rescue Craft (FRC) while being launched and retrieved near the Hibernia GBS. The evaluation was based on relatively simple engineering calculations of wind and wave effects on the FRC. The objective of the study was to identify areas where the motions may become hazardous to the FRC crew.	study	IMD (NRC)	U
742	Majid, I., Nawwar, A.M.	The development of in-water survivor recovery strategies for the Hibernia Fields. Report FR 1509C-2	re	Arctec Canada Limited	1994, June	Canada	unavail.	.	report	FTL	U

Table 2.7 Typical integrated EER data

Ref. #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
73	Baskin, Alexander; Buzuyev, Arkady and Yakshevich, Evgeny	Operational Aspects.	eer	INSROP Working Paper	1995	unavail.	1-133	Summary: Results of investigations of operational aspects of international sailing through Northern Sea Route: legislation, route planning, navigation, communications, infrastructure, crew training, vessel performance, ice accident, and search and rescue. Focuses on support of international shipping demands with regard to peculiarities of sailing in Russian Arctic.	periodical	SPRI	U
186	Bercha, F.G., Cerovšek, M.C., Churcher, A.C., and Williams, D.S.	Escape, Evacuation, and Rescue Modelling for the Arctic Offshore.	eer	Bercha Group	unavail.	Canada	8	Summary: This paper describes both network and Monte Carlo probabilistic simulation models for open water and Arctic EER simulations for Skyscape (chute) and TEMPSC (lifeboat) systems in partial ice cover locations off the East Coast of Canada, and certain novel systems of dynamic but 10/10 ice cover in Eastern Russian Arctic. The effect on EER success probabilities of principle ice cover properties including ice thickness, ice fraction, and dynamics is illustrated. Conclusions and recommendations for development of optimal systems are presented.	paper	Bercha	U
308	Hagen, Jan-Erik	Safety technology, emergency equipment and sea rescue techniques: PERD task 6.2 program evaluation workshop, St. John's Newfoundland, May 26-27, 1988.	eer	Canada Oil and Gas Lands Administration	1988	Ottawa	unavail.	Subjects: Offshore structures - Safety measures - Congresses Survival and emergency equipment - Congresses.	workshop proceedings	NEB TC1650/S34/ 1988	U
506	Moxie Media Inc.	Orientation and safety for the offshore oil industry.	eer	Moxie Media Inc.	unavail.	New Orleans, La	unavail.	Summary: Available in English, Portuguese and Spanish. Employees new to the offshore oil industry need to keep abreast of the latest developments and safety requirements. From the North Sea to the Gulf of Mexico, to Arctic Seas, this video explores in depth the ever-changing role of oil and service company personnel and equipment. (43 min).	video	Moxie Media Inc., Off-OrientSale	For Sale
10	National Research Council of Canada, Institute for Marine Dynamics	Workshop on Escape, Evacuation and Rescue in the Offshore Industry.	eer	National Research Council of Canada, Institute for Marine Dynamics	1999, June 17 & 18	St. John's, Nfld.	122	Summary: A "Workshop on Escape, Evacuation, and Rescue in the Offshore Industry" was held at Memorial University of Newfoundland on June 17th and 18th, 1999. The workshop was sponsored by the Institute for Marine Dynamics (IMD), National Research Council (NRC) in response to a proposal for a research program that would be funded jointly by National Resources Canada, Transport Canada, the Canadian Association of Petroleum Producers, and the National Research Council. The workshop was organized as a forum in which to garner input from the stakeholders in the offshore industry, (...). The primary objective of the workshop was to identify the safety issues in Escape, Evacuation, and Rescue (EER) in the offshore industry. These issues would then be used in the development of a research program that should lead to the improvement of safety, and provide the groundwork for the development of performance standards for offshore EER.	workshop proceedings	Bercha	U
16	Simoes Re, Antonio J.	Workshop on escape, evacuation and rescue in the offshore oil industry.	eer	IMD (NRC)	1999	Canada	unavail.	Summary: Workshop organized as a forum to garner input from the stakeholders, such as the operators, regulators, offshore petroleum boards, workers, manufacturers, consultants, and other interested parties. The primary objective of the workshop was to identify the safety issues in Escape, Evacuation and Rescue (EER) in the offshore industry. These issues will be used in the development of a research program that will lead to improvement of safety, and provide the groundwork for the development of performance standards for offshore EER.	research paper	IMD (NRC)	U

Table 2.8 Typical human factors data

Ref. #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
591	Clisby, C.	Experiencing Fires.	h	in: An Introduction, in Fires and Human Behaviour - Canter (ed.)	1980	unavail.	unavail.	.	book	USCG	U
530	EQE International Inc.	Study of human factors in offshore operations--EQE International Inc.	h	MMS	unavail.	Herndon, Va	unavail.	Summary: A study by EQE International Inc to define human factors that affect responses during normal and emergency operations on offshore platforms, then develop a methodology which can be used to address both normal and emergency situations.	study	MMS Project 220	U
101	Hervey, G.R.	The physiology of survival at sea.	h	Science News, (Hardmonsworth)	1955	unavail.	72-89	Summary: Special reference to cold climates and British Naval inflatable tented life-raft.	article	SPRI Pam 656.608	U
636	Jenner, B.P.	Technical and human factors in the prevention and control of shipboard fires.	h	in: Fire Safety on Ships: Developments into the 21st Century.	1994	unavail.	unavail.	.	book	USCG	U
529	Primatech, Inc.	International workshop on use of human and organizational factors (HOF) in the management of safety and environmental hazards for offshore operations facilities.	h	MMS	1996	Herndon, Va	unavail.	Summary: Workshop was held 16-18 December, 1996. Studies have been initiated that emphasize human and organizational factors that affect responses during normal and emergency operations on offshore platforms. Offshore facilities provide a minimum of space for placement and operations of complex and densely configured drilling, production and processing equipment. Facility systems must be designed, arranged, operated, and inspected to minimize the potential for failure of any element. The failure of a single element in these tight quarters can cause a cascade of sequential failures, resulting in a catastrophic failure of the system.	book	MMS Project 250	U
649	Ribbe, Jones and McCarthy.	Use of Videotaped Peer Modelling in the acquisition of emergency coping skills: Active versus passive strategies.	h	Fire Technology	1995	unavail.	unavail.	.	journal	USCG	U

Table 2.9 Typical preparedness, maintenance, drills, and training data

Ref. #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class
292	.	Working the offshore safety. [video recording]	p	[s.l]	1986	Canada	unavail.	Subjects: Oil well drilling, Submarine - Safety measures Offshore oil industry - Canada - Safety measures. Notes: VHS. Time: 10 minutes.	video	NEB TN873/.C32/ W67	U
485	Fuller, J.F.C.	A changing approach to safety. In: Nautical Institute Commercial management for shipmasters: A practical guide.	p	The Nautical Institute	1996	London	159-171	.	book	IMO Library	U
477	Kvamsdal, R./ Forde, J.M.	Safe and efficient ships: Friendly to the environment. In: Institute of Marine Engineering Safe and efficient ships: New approaches for design operation and maintenance - ICMES 96: International Conference on Marine Engineering Systems (13-14 June 1996).	p	The Institute of Marine Engineers	1996	London	11-17	.	periodical	IMO Library	U
509	Moxie Media Inc.	Avoiding slips, trips and falls in the offshore oil industry.	p	Moxie Media Inc.	unavail.	New Orleans, La	unavail.	Summary: Hosted by a leading safety expert on the subject who instructs offshore personnel on production platforms, drilling rigs and maritime vessels about how to prevent injuries and fatalities from the leading cause of accidents in all industries - slips, trips and falls. Proper shoewear, awareness, slipping and tripping hazards, housekeeping, physical conditioning and ergonomic engineering are all covered in this eye-opening presentation. (30 min).	video	Moxie Media Inc., (OFF-Slip/Trip)	For Sale
761	Texas Engineering Extension Service	TEEX Centre for Marine Safety and Training.	p	TEEX	unavail.	United States	4	Summary: The TEEX Centre for Training and Safety website covers the following areas: training, products, programs, services, and resources. The Centre for Marine Training and Safety provides mariners with courses that are customized to the Ocean-going Maritime Industry specifications and regulatory requirements. All courses are designed to exceed the International Maritime Organization's (IMO) recommendations for Seafarer's Training, Certification, and Watchkeeping (STCW) code and have received the approval of the U.S. Coast Guard where appropriate. These basic safety training courses are also recommended by the Norwegian Oil Association.	world wide web	TEEX	U
455	Transport Canada	Marine emergency duties training programme. TP4957E	p	Transport Canada	unavail.	Canada	173	Summary: *Scope and Application*: The International Convention on Standards of Training, Certification and Watchkeeping for seafarers (STCW), 1978 as amended in 1995 provides standards regarding emergency, occupational safety and survival functions in Chapter VI of the mandatory Code "A". Compliance with requirements of the above standards to meet mandatory minimum requirements for familiarization, basic safety training and instructions for all seafarers; and training in advanced fire fighting for seafarers designated to control fire fighting operations and sufficient knowledge to launch and take charge of a survival craft in emergency situations. Goals: to provide seafarers with an understanding of the hazards associated with the marine environment and their vessel. To provide training in skills required to cope with such hazards to an extent appropriate to their functions on board in shore based approved training courses.	book	Transport Canada	U

Table 2.10 Typical East Coast data

Ref. #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
323	.	Interannual variability of climate of the Canadian east coast.	ea	Atmospheric Environment Service	1986	Ontario	unavail.	.	book	NEB QC 980.15/C3/ no.86-17	U
271	.	Federal offshore statistics: leasing, exploration, production, revenue.	ea	Dept. of the Interior	unavail.	Wash-ington, D.C.	unavail.	.	statistics	NEB HD9560.4/08	U
281	.	Comparison of major construction projects and offshore hydrocarbon developments in Atlantic Canada/ Gardner Pinfold Economists Limited and Atlantic Consulting Economists Limited.	ea	Micromedia Limited	1997	Toronto, Ont.	unavail.	Subjects: Offshore oil industry - Atlantic coast (Canada) Offshore gas industry - Atlantic coast (Canada)	Mfiche	NEB HC120/.E5/ no.015/Mfiche	U
269	Gardner, Michael	Comparison of major construction projects and offshore hydrocarbon developments in Atlantic Canada/ Gardner Pinfold Economists Limited and Atlantic Consulting Economists Limited.	ea	Environmental Studies Revolving Funds	1985	Ottawa	86	Summary: Offshore oil and gas development will involve the construction of onshore facilities, as well as the onshore construction of structures for installation offshore. These activities will generate substantial levels of employment and may have significant impacts on communities in the Atlantic Provinces. The nature and magnitude of these potential impacts are not well understood by the majority of people in the region. This is due in part to the general mystique surrounding offshore development, and in part to the limited access most people have to meaningful information about specific offshore projects. It is due also to the absence of any frame of reference for assessing the scale and implications of these projects. This report is an attempt to provide just such a frame of reference. It contains a body of data allowing direct comparisons to be made among recent major construction projects familiar to residents of the Atlantic Provinces and the proposed Venture and Hibernia offshore developments. Included in the comparative data considered relevant for developing the frame of reference are project schedules, capital costs, employment requirements, and social impacts. The report also contains descriptive profiles of each of the projects.	report	NEB HC120/.E5/E52/ no.015	U
775	Offshore Technology	Terra Nova Petro-Canada oil field project-Grand Banks.	ea	Offshore Technology	unavail.	Canada	5	Summary: This article is a brief overview of the Terra Nova Petro-Canada oil field project of Newfoundland.	world wide web	Offshore Technology	U
137	Riska, Kaj	Theoretical modelling of ice-structure interaction. In: Jones, Stephen J.; McKenna, Richard F.; Tillotson, Joy and Jordaan, Ian., eds. Ice-Structure Interaction. IUTAM/IAHR Symposium, St. John's, Newfoundland, Canada, 1989.	ea	Springer-Verlag	1991	Berlin	595-618	Summary: Describes principles of theoretical analysis of structure-ice interaction, with salient processes considered in terms of structure motions, and in particular, penetration of structure into ice. Example of procedure is given by analyzing ship ramming into finite ice floe. Discussion, p. 617-618.	book	SPRI Shelf 624.145	U

Table 2.11 Typical North Sea data

Ref. #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
223	Andersen, Hakon, with Collett, John Peter	Anchor and balance: Det Norske Veritas, 1864-1989.	n	Cappelens	1989	Norway	unavail.	Subjects: Norske Veritas (Organization) - History Insurance, Marine - Norway - History Shipping - Norway -History.	book	NEB HE969/.N6/A53	U
71	Armstrong, Terrance Edward.	Northern Sea Route operations in the 1986-87 season. In: Brigham, Lawson W., ed. The Soviet Maritime Arctic.	n	Belhaven Press in assoc. with the Scott Polar Institute	1991	London	150-157	Summary: Gives overview of Soviet icebreakers and other vessels in use, and also operations in Kara, Laptev, east Siberian and Chukchi Seas. Gives examples of problems come to light as result of glasnost. Outlines ice conditions for same period.	book	SPRI Shelf (*68)[1991]	U
86	Daley, C.G.; Ferregut, C. and Brown, R.	Structural risk model of Arctic shipping. In: Jones, Stepheen J.; McKenna, Richard F.; Tiloston, Joy and Jordaan, Ian J., eds. Ice-Structure Interaction. IUTAM/IAHR Symposium, St. John's, Newfoundland, Canada, 1989.	n	Springer-Verlag	1991	Berlin	509-540	Summary: Risk analysis model has been developed, focusing on computer program Arctic Shipping Probability Evaluation Network (ASPEN). Parameters include: environmental definition navigation and ice avoidance process (including human behaviour), ship/ice collision mechanics, and structural limit states (failure mechanics). All aspects are variable and should be treated statistically. Discussion, p. 537-540.	book	SPRI Shelf 624.145	U
139	Sandkvist, Jim	Impact assessment and contingency planning remote operations, including Swedish case. In: Simonsen, Henning, ed. Proceedings from the Northern Sea Route Expert Meeting 13-14 October 1992, Tromso, Norway.	n	Fridtjof Nansen Institute	1993	Lysaker, Norway	93-107	Summary: Presents example of Swedish icebreaker Oden illustrating environmental impact assessment as focused on ship. Describes measures relating to normal operations as well as emergency procedures. Discusses preventative measure required to minimize environmental impact.	book	SPRI Shelf (*54):061.3	U
141	Semanov, G.N.; Kirsh, Y.B. and Grachyova, O.B.	The NSR oil spill contingency plan.	n	INSROP Working Paper	1999	unavail.	1-106	Summary: INSROP Sub-program II: Environmental Factors. Comprehensive report on different components of NSR Oil Spill Contingency Plan: response area and risk assessment; operation control headquarters; appointment of experts; receiving and transmitting information; combating oil spills; safety measures; training exercises; procedures for recording costs and their recovery.	periodical	SPRI	U
57	Watson, Gordon G.	Technical aspects of ice navigation and port construction in Soviet Arctic. In: Brigham, Lawsen W., ed. The Soviet Maritime Arctic. London: Belhaven Press in assoc. with the Scott Polar Institute, 1991 (Polar Research Series).	n	Polar Research Series	1991	UK	158-176	Summary: Describes various types of convoy formations with their advantages and disadvantages: single-file ice convoy, convoy in echelon, short tow operating in rivers and estuaries and tow in tandem. Gives details of recent improvements in ship construction with particular reference to Medyug conversion to Thyssen/Waas bow and icebreaking-clearing attachment. Other topics covered are berthing in coastal ice belt; building jetties. Discusses prospects for international use of Northern Sea Route in view of technical developments.	book	SPRI Shelf(*68)[1991]	U

2.3 East Coast Marine Drill and Safety Equipment Data

2.3.1 Introduction

Secunda Marine Limited, a vessel operator in the East Coast arena of operation and a member of the Bercha consortium for this work, has compiled drill data over the past 10 years for each of its vessels. The drills for which data were compiled include fire drills, abandon ship drills (to embarkation point), and man overboard drills. The total amount of data is approximately 200 drills per year for several different vessels, for sea-states ranging up to moderate, with sufficient documentation to permit analysis of individual and group human factor performance parameters. Under this subtask, Secunda has compiled the original data and converted it to the format described in Section 2.3.2 for the estimation of unit-human factor performance parameters for different routes, environmental conditions, and complements.

Associated Marine Equipment Limited, a wholly owned subsidiary of Secunda Marine Limited, collects and maintains databases on equipment and procedures applicable to East Coast EER. Associated Marine Equipment also provided a summary listing of marine safety equipment and procedures applicable to the East Coast, including particular reference to existing manufacturers and availability sources for specifications of such marine equipment.

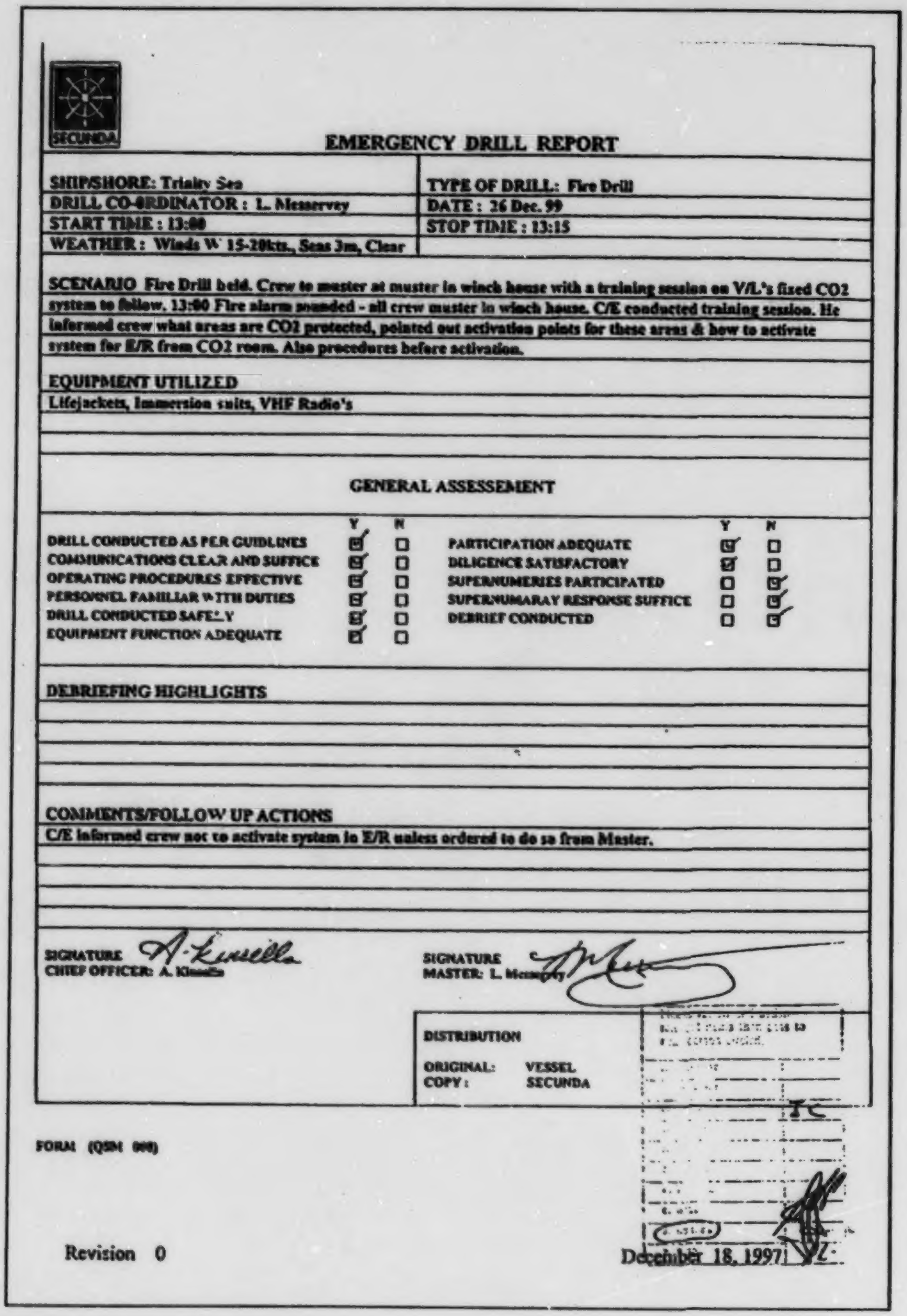
2.3.2 Marine Drill Data

Figure 2.1 shows the raw data (Emergency Drill Report form) for a marine fire drill. Similar data were collected for a man overboard drill, fast rescue craft launch drill, and Dacom rescue scoop drill. This data, combined with complementary ship architecture data, can be converted into unit-human factors parameters. Table 2.12 shows the data formats used to convert these data into unit-performance parameters. For example, in Table 2.12, the data table for the fire drill, an analysis of the longest route within the context of the ship geometry can be used to generate the unit progress parameters as indicated in the table. Correlation of computed unit progress parameters with sea-states, complements, and route types can be used to develop human performance escape factors for input to the RPT.

Human factors unit parameters determined from these data were found to have a large variance, necessitating the conduct of dedicated human factors experiments as described in Chapter 4.

2.3.3 Marine Safety Equipment Data

Marine safety equipment data includes listings covering description, availability, location, and specifications. Table 2.13 illustrates some of the principal entries from these data obtained by Associated Marine Equipment. Appendix A gives a complete listing of the equipment data collected.



SECUNDA

EMERGENCY DRILL REPORT

SHIP/SHORE: Trinity Sea	TYPE OF DRILL: Fire Drill
DRILL CO-ORDINATOR : L. Messervey	DATE : 26 Dec. 99
START TIME : 13:00	STOP TIME : 13:15
WEATHER : Winds W 15-20kts., Seas 3m, Clear	

SCENARIO Fire Drill held. Crew to muster at muster in winch house with a training session on V/L's fixed CO2 system to follow. 13:00 Fire alarm sounded - all crew muster in winch house. C/E conducted training session. He informed crew what areas are CO2 protected, pointed out activation points for these areas & how to activate system for E/R from CO2 room. Also procedures before activation.

EQUIPMENT UTILIZED

Lifejackets, Immersion suits, VHF Radio's

GENERAL ASSESSEMENT

	Y	N		Y	N
DRILL CONDUCTED AS PER GUIDLINES	☑	☐	PARTICIPATION ADEQUATE	☑	☐
COMMUNICATIONS CLEAR AND SUFFICE	☑	☐	DILIGENCE SATISFACTORY	☑	☐
OPERATING PROCEDURES EFFECTIVE	☑	☐	SUPERNUMERIES PARTICIPATED	☐	☑
PERSONNEL FAMILIAR WITH DUTIES	☑	☐	SUPERNUMARAY RESPONSE SUFFICE	☐	☑
DRILL CONDUCTED SAFELY	☑	☐	DEBRIEF CONDUCTED	☐	☑
EQUIPMENT FUNCTION ADEQUATE	☑	☐			

DEBRIEFING HIGHLIGHTS

COMMENTS/FOLLOW UP ACTIONS

C/E informed crew not to activate system in E/R unless ordered to do so from Master.

SIGNATURE A. Kinsella
CHIEF OFFICER: A. Kinsella

SIGNATURE
MASTER: L. Messervey

DISTRIBUTION

ORIGINAL: VESSEL
COPY : SECUNDA

FORM (QSM 000)

Revision 0

December 18, 1997

Figure 2.1 Typical fire drill report

Table 2.12 Typical emergency drill report data compilation – fire drill

No	Start Time	Stop Time	dT [min] secs	# POB	Start Delay		Activity at Muster Station before "Stop Time"		Wind Data		Sea [m]	Vis [Nm]	Longest Route					Remarks
					Description	Time in secs	Description	Time in secs	[kts]	Dir			# of People	Walkways In [m]	Walkways Out [m]	Stairway [m]	Bottle-necks	Drill Scenario
1	1300	1316	[illegible]	14	Sound alarm, evacuation of space, close ventilation	90	Don fire suits, BA sets, check fire extinguishers and hoses	180	25	WSW	3	6	2	40	10	7	1	Fire in Engine Room
2	1323	[illegible]	[illegible]	14	Sound alarm, isolate space	85	Don fire and BA sets	120	20	WNW	2.5	8	"	"	"	"	"	Fire at Diver's Shack
3	1250	1310	[illegible]	14	Sound alarm, close port holes	80	Personnel removed from scene and taken to ship's hospital	180	30	SSW	3.5	8	"	"	"	"	"	Fire 2nd Mate's Cabin
4	1300	1317	[illegible]	14	Isolate fuel shut off, shut ventilation, evacuate area	120	Emergency fire pump start up demonstrated	120	25	N	3.5	2	"	"	"	"	"	Boiler room fire
5	1230	1250	[illegible]	14	Sound alarm, shut cabin doors and port holes	65	Start emergency fire pump, run up monitors	120	30	NW	2.5	10	"	"	"	"	"	Water curtain for rig
6	1244	1300	[illegible]	14	Sound alarm, proceed to station rig fire hoses	120	First aid response, don BA and fire suits	120	25	SE	4	4	"	"	"	"	"	Engine Room stores fire
7	1218	1230	[illegible]	14	Alarm, shut ventilation, muster, evacuate area	90	First aid, rig hoses, transport casualty	120	25	NW	3	8	"	"	"	"	"	Fire in laundry room
8	[illegible]	1014	[illegible]	14	Alarm, muster, proceed to fire area	120	BA and fire suits, rig hoses, boundary cooling	180	25	WSW	2	10	"	"	"	"	"	Fire upper salvage locker
9	1255	1316	[illegible]	14	Alarm, proceed to muster, close port holes and doors	90	BA, fire extinguisher, boundary cooling	120	35	NE	2	2	"	"	"	"	"	Galley fire
10	1045	1050	[illegible]	14	Alarm, muster	55	Rig hoses, BA and fire suits start fire pump	120	5	var	1	8	"	"	"	"	"	General equipment familiarisation
11	1310	1330	[illegible]	14	Alarm, evacuation, close ventilation	90	CO2 release (simulated), boundary cooling	130	5	WSW	1	8	"	"	"	"	"	Fire in paint locker
12	1340	1415	[illegible]	14	Alarm, muster fire parties	90	Rig hoses, BA and fire suits, start fire pump	120	20	SW	1	10	"	"	"	"	"	Upper salvage locker
13	1633	1643	[illegible]	14	Alarm, muster, close port holes, doors, shut ventilation	90	BA and fire suits, rig hoses, fixed liquid system simulated	120	20	W	1	8	"	"	"	"	"	Galley fire
14	1754	1813	[illegible]	14	Alarm, muster, close ventilation	120	BA set, fire suits and hoses	150	0	var	0.5	10	"	"	"	"	"	Fire during bunkering operations
																		Only 14 drills are recorded because on a small ship such as a support vessel the scenarios become repetitive.
																		The longest route to either muster or escape to main deck would always be from the engine room.

Table 2.13 Typical marine EER equipment data

SYSTEM	DESCRIPTION	CONTACT INFO
BRIDGE	WALKABLE, DRY, EXTENDED EVACUATION SYSTEM	MGK (SCOTLAND) Polbeth Industrial Estate Polbeth West Calder West Lothian EH55 8TJ Scotland UK Tel: 011-44-1506-871757 Fax: 011-44-1506-87341 Sales@mgkscot.demon.co.uk www.ngkscot.demon.co.uk
BRIDGE	SEE ABOVE	SIMPSON-DAVITS Building 13 Shamrock Quay William Street Southampton SO14 5Q1 UK Tel: 011-44-1703-631834 Fax: 011-44-1703-330998 Sales@simpson-davits.co.uk
INFLATABLE CHUTES	GRAVITY LAUNCHED SYSTEM, ADAPTABLE TO ALL WEATHER AND SEA CONDITIONS	DBC MARINE SAFETY Zodiac International Marine Division 2 Rue Maurice Malet 92130 ISS-Y Malinicaux France Tel: 011-33-141-232323 Fax: 011-33-141-232398 zodiac.czht@aol.com www.zodiac.fr
INFLATABLE CHUTES	MEC MARINE EVACUATION CHUTE	DUNLOP BEAUFORT 12351 Bridgeport Road Richmond BC V6V 1J4 Tel: 604-278-3221 Fax: 604-278-7812 Contact: Paul Higginbotham
INFLATABLE CHUTES	SEE DBC SYSTEM	CHEMRING P.O. Box 326 1420 Wolf Creek Trail Sharon Center Ohio 442274-0326 USA Tel: 216-239-1352 Fax: 216-239-1352 Contacts: Paul Jensen / James Connor

2.4 East Coast Fixed Installation EER Data

2.4.1 Introduction

There are currently two major East Coast operations: Hibernia and the Sable Offshore Energy Project (SOEP). Discussions are ongoing with Hibernia regarding access to its EER information and data. SOEP, however, has cooperated with the current study by providing appropriate EER data and studies.

A location map for SOEP facilities is given in Figure 2.2, while a schematic description of the onshore and offshore facilities is shown in Figure 2.3, based on Volume 2 of the Development Plan Application. When fully developed, the production facilities for SOEP will include up to six production platforms and an accommodation platform. The central facilities at Thebaud will be continuously manned, and include wellheads, production and processing equipment, and an adjacent accommodation platform. The remaining fields, Venture, North Triumph, South Venture, Glenelg, and Alma, will be developed with normally unmanned satellite platforms. The satellite platforms will be tied back to the Thebaud central processing facilities platform via subsea interfield flowlines. A single subsea pipeline will transport the gas from Thebaud to landfall in the Country Harbour area.

Following landfall, the marine pipeline offshore segment will transport the gas and associated natural gas liquids to an onshore natural gas processing plant – the Goldboro Gas Plant, which includes a slugcatcher at its inlet – and related gas processing facilities, approximately 2 km inland in the Country Harbour area. This plant will initially deliver a sales gas volume of approximately 14.4 million m^3/day into the Maritimes and Northeast Pipeline, supplying markets in Canada and the Eastern United States. Natural gas liquids (NGL) extracted from the produced gas will be transported via a buried NGL pipeline to NGL processing, storage. and distribution facilities in the Point Tupper area on Cape Breton Island. This NGL fractionation plant will process approximately 3300 m^3/day of natural gas liquids, producing roughly 950 m^3/day of specification propane, 520 m^3/day of butane, and 1844 m^3/day of condensate. The propane and butane will be piped to a nearby rail terminal operated by SOEP, while the condensate will be stored and shipped through the Statia Marine Terminal at Point Tupper.

2.4.2 Typical SOEP EER Data

Table 2.14 summarizes SOEP studies, procedures, and data relating to East Coast EER. As can be seen, the listings range from EER analyses, to evacuation system studies, to EER procedures. SOEP escape data were also collected and used to partially validate the RPT as described in Section 3.3.

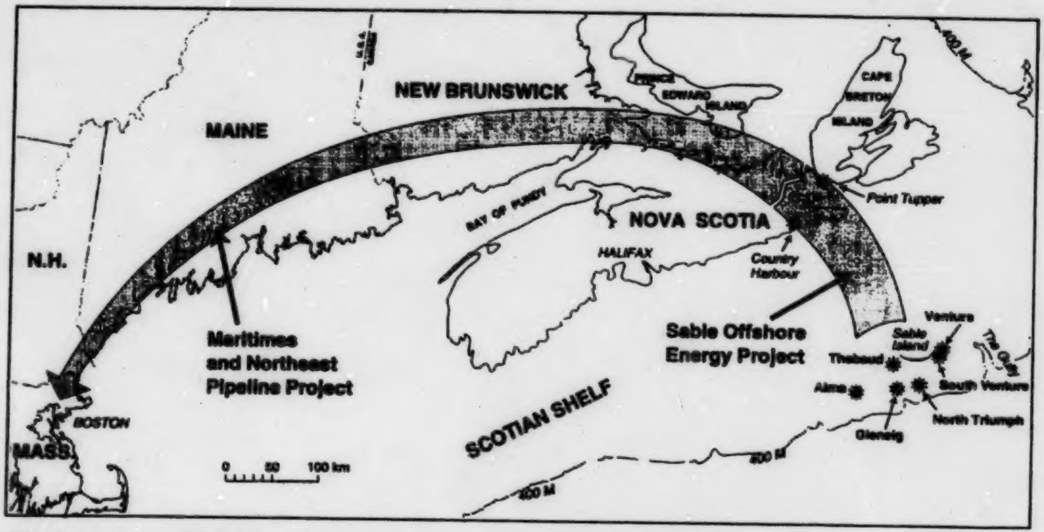

NEW BRUNSWICK
PRINCE EDWARD ISLAND
CAPE BRETON ISLAND
400 M
MAINE
Point Tupper
BAY OF FUNDY
NOVA SCOTIA
N.H.
HALIFAX
Country Harbour
Sable Offshore Energy Project
Maritimes and Northeast Pipeline Project
Venture
Sable Island
The Gully
Thebaud
Alma
South Venture
North Triumph
Glenelg
SCOTIAN SHELF
BOSTON
MASS.
0 50 100 km
200 M
400 M

Figure 2.2 SOEP location map

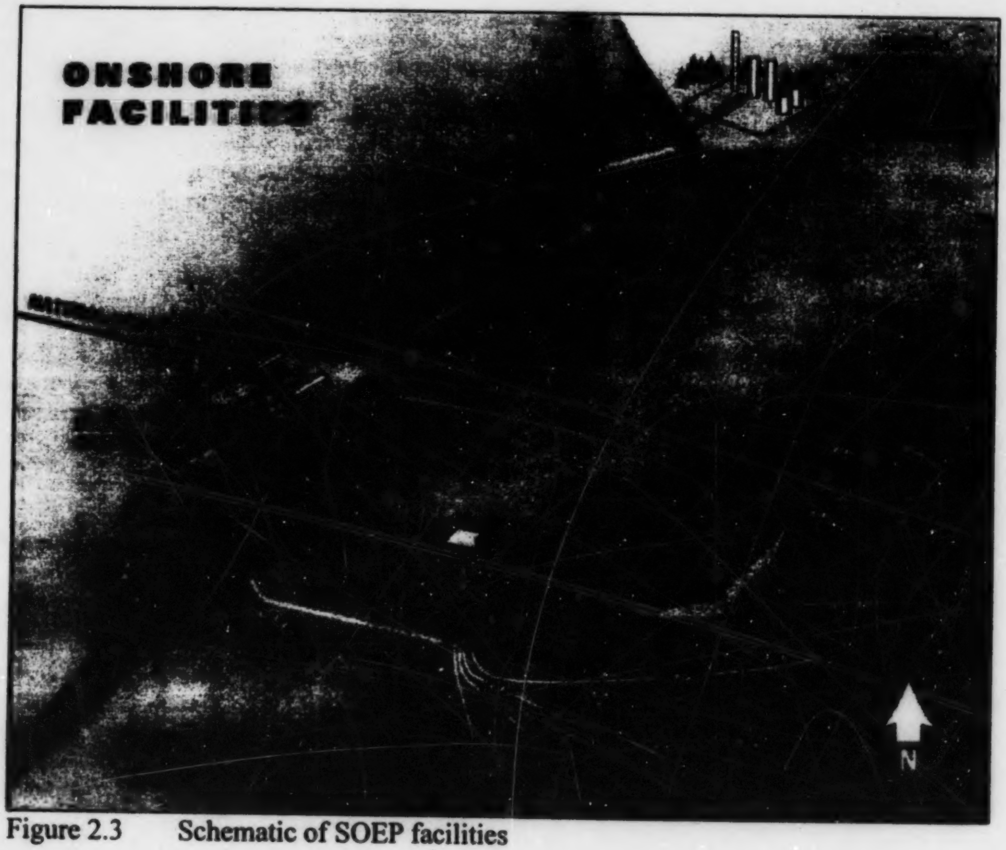

ONSHORE FACILITIES
N

Figure 2.3 Schematic of SOEP facilities

Table 2.14 SOEP EER data summary

Data Summary
Bercha International Inc., *Concept Safety Evaluation for the SOEP*, Volumes 1 and 2, Final Report, September 1997.
Bercha International Inc., *Fire, Escape, Evacuation, and Rescue Study*, Volume 1, Final Report to Sable Offshore Energy Project, July 1998.
Bercha International Inc., *Ship/Platform Collision Probability Assessment*, Special Report to Sable Offshore Energy Project, October 1997.
Caldwell Consulting Limited, *Escape/Muster Study for the Hibernia Installation*, December 1994.
DNV, *Evacuation Study for Sable Offshore Energy Project*, Draft Report Revision 0, February 1998.
E&P Forum, *E&P Forum Report No. 11.8/250*, Report, March 1997.
Evacuation, Escape, and Rescue Technical Advisory Group (EERTAG*), An Assessment of the Evacuation of an Offshore Installation by TEMPSC*, EERTAG/D3/97, November 1997.
Hewitt, I and Attar-Zadeh, R., *Analyzing Smoke and Toxic Gas Hazards: Preventing Ingress into TSRs*, British Gas, October 1992.
Hewitt, I. and Atter-Zadeh, R., *Analyzing Smoke and Toxic Gas Hazards: Preventing Ingress into TSRs*, Report, October 1992.
Pritchard, M.J. and Corley, L.T., *Thermal Impact on Structures from Large Scale Jet Fires*, Institution of Mechanical Engineers, May 1997.
Sable Offshore Energy Project, *Design Basis Memorandum*, Volumes 1-5, 1998.
Sales, G.S. and McKibben, B., *Ensuring Air Breathability within the TSR Including Preventing Smoke and Gas Ingress*, Consafe Engineering, 1996.

2.5 North Sea Data

The search for North Sea EER data was carried out by D. Williams, a subcontractor located in the UK. Sources personally contacted include the United Kingdom Offshore Operators Association (UKOOA), the Health and Safety Commission, the Oil Industry Advisory Committee, the Oil and Gas Producers Association, British Gas, and a variety of personal contacts. Other contacts included the Escape, Evacuation, and Rescue Task Group (EER TAG) set up jointly by UKOOA and the Health and Safety Executive (HSE). The variety of software programs applicable to components of the EER process was also reviewed, including programs such as ARENA (by Hoskins Operational Research), TEER (a subset of the British Gas hazard analysis suite), and the escape model and evacuation model developed by Det Norske Veritas. Finally, a number of data sources on real-time drills for the Liverpool Bay installations by BHP were available.

Table 2.15 summarizes the most salient items from the North Sea database. As can be seen, the listings range from EER studies to detailed incident accounts. A full listing of the North Sea data compiled is given in Appendix A. Additional information on UK approaches to performance-based standards was provided by A. Kingswood of ARK Safety, a member of this project team, as described in Section 6.3 of this report.

2.6 Evacuation Systems Information

2.6.1 Introduction to Evacuation Systems

This section summarizes key elements of information from the data gathered on evacuation systems, as described in the previous sections of this chapter and in Appendix A.

The information may be subdivided into the following types and subtypes of evacuation systems:

- Lifeboat-based systems
    - Davit-launched
    - Free-fall
    - Arctic systems
    - Seascape
- Mass evacuation systems
    - Liferafts
    - Gondolas
    - Escape chutes
    - Collapsible stairs
    - Bridges
    - Other devices

Although the EER model described in Chapter 3 only includes those systems that are currently most commonly used and for which quantitative data were available, this section briefly discusses a wider variety of systems.

Table 2.15 North Sea data

ID	Author	Title/Call No.	Publisher	Date	Place	# pages	Summary	Form	Location	Class.
00	Oil Companies International Marine Forum (OCIMF)	Results of a Survey into Lifeboat Safety.	OCIMF	July 1994	London and Bermuda	19	Investigation of accidents and incidents involving davit launched TEMPSC, with proposals for (remedial) countermeasures for consideration by industry. The report is based on an industry survey conducted by OCIMF demonstrating most accidents occur during training drills. Although nearly all data comes from marine vessels experience, the lessons are equally appropriate to survival craft installations on fixed offshore platforms.	Report	Bercha	U
04	UKOOA	The Management of Competence and Training in Emergency Response.	UKOOA	1997	London	Unavail.	Guidelines setting out recommendations on the management of competence and training in emergency response for all persons who work on, or visit, offshore installations in the United Kingdom Continental Shelf (UKCS).	Guidelines	Bercha	U
06	UKOOA	Guidance on Police Roles & Responsibilities for Oil & Gas Offshore Installations in Emergency Situations.	UKOOA	1997	London	Unav.	Provides guidance for operating companies with focus on the police approach and immediate response in emergency situations.	Guidelines	Bercha	U
08	E&P Forum	Lifeboat Safety Guidelines.	Oil Industry International Exploration & Production Forum (E&P Forum)	June 1995	London	7	Guidelines addressing lifeboat operational and maintenance aspects, with emphasis on preventing unwanted launches, pertaining to fixed and floating offshore exploration and production facilities.	Guidelines	Bercha	U
11	UK Dept. of Transport	Assessment of the Suitability of Standby Vessels Attending Offshore Installations.	HMSO	Revised 1991	London	48	Code for the assessment of the suitability of standby vessels for the guidance of the (UK) offshore and standby vessel industries. Covers all essential requirements for standby vessel duties, including emergency evacuation, rescue and recovery to a place of safety.	Code	Bercha	U
12	UK Health & Safety Executive	Report on EESC Visit to ESVAGT (Danish Offshore Rescue Service).	HSE/OTO (OTO 98 153)	August 1998	London	32	Report of a visit by the Emergency Evacuation of Offshore Installations Steering Committee (EESC) to the Danish Offshore Rescue Service (ESVAGT) to obtain lessons learned from the rescue of personnel from the stricken drilling rig WEST GAMMA in August 1990. The rescue was accomplished in particularly hazardous conditions (Beaufort 9, 12 metre waves) where other rescue services had failed.	Report	Bercha	U

2.6.2 Lifeboat-Based Systems

General

Lifeboats are manufactured from fire resistant glass fibre-reinforced polyester (GRP) or metal. Equipped with a sprinkler system to protect persons on board from poolfires on the sea, they are also fitted with self-contained breathing air systems providing breathing air to the full design complement for 10 minutes. Requirements and detailed specifications for lifeboats are included in the International Maritime Organization Safety of Life at Sea (SOLAS) [36] requirements. The principal classes of lifeboats are the conventional davit-launched lifeboats and free-fall lifeboats.

Critical features of lifeboat evacuation include:

- availability of lifeboats suitable for launch given the initiating accident;
- time taken to load and launch the lifeboat;
- risk of unsuccessful launch;
- ability of lifeboat to get clear of the installation;
- seaworthiness of lifeboat for conditions occurring so that evacuees survive until rescued.

Primary considerations for the selection of lifeboats include:

- ability of platform personnel to access the lifeboats from the muster stations under severe accident conditions such as heat, smoke and explosion , installation deformation, and environmental conditions;
- ease of access to lifeboat seats thereby reducing boarding time;
- number of lifeboats available in relation to complement;
- reduced launching time through increased reliability of launching mechanisms and rapid deployment under unfavourable weather conditions;
- ability of lifeboat to get away from the vicinity of the platform after launch.

Davit-launched lifeboats

Davit-launched lifeboats, as illustrated in Figure 2.4, are the most common conventional lifeboats in the marine and offshore industries. Traditionally they are mounted parallel to the sides of offshore installations and lowered by fall wires from a davit on the muster deck. Once in the water, the fall wires are released and the craft is driven away under its own power by the coxswain. This system of launching was inherited from the maritime industry. Davit-launched lifeboats should be able to function for a time in a sea-level fire or in toxic gas as they are sealed, have an independent air supply, and are fitted with external water sprays. If toxic gas is present at the lifeboat embarkation point then the lifeboat will not be boarded; rather, personnel will remain in the Temporary Refuge (TR) or get to an alternate evacuation location.

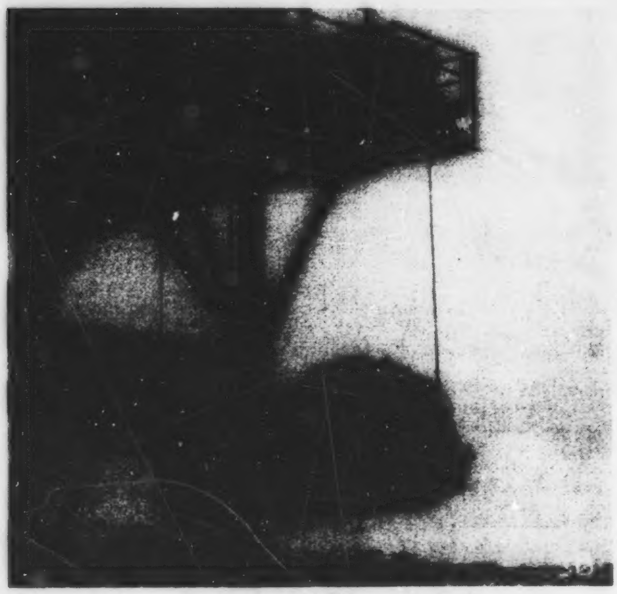


Figure 2.4 Twin davit lifeboat launch

The hook release mechanism of davit-launched lifeboats has historically been a major problem during training as well as emergencies. Failure to release from the installation or coxswain error may prove to be disastrous for the occupants of the lifeboat. Two release mechanisms are employed. The "offload" mechanism requires all weight to be taken off the lifeboat hook, which is problematic in high seas. The "onload" mechanism operates in the same fashion but also has a manual release with the potential for accidental release and drop from an elevated location.

Further problems have been experienced with the system for remote operation of the winch brake. The remote control wire has been known to tangle, leading to brake jamming stopping the lowering operation. This failure mode is seen to be critical during emergency evacuations. Davit-launched lifeboats are also prone to collision with the installation structure in unfavourable weather conditions or installation listing, and rely on their own engine power to move away from the danger zone.

- *Preferred Orientation and Displacement system*

The PROD system, as illustrated in Figure 2.5, is an adaptation of the davit-launch system intended to give the lifeboats an impetus away from the platform. The PROD system comprises a long, tapered, flexible GRP boom attached at right angles to the offshore structure by a hydraulic hinge. The boom may be a single length one-piece construction or hydraulically articulated to reduce storage space. The boom's outboard end is connected to the bow of the lifeboat by a fixed-length wire tag line incorporating an automatic release coupling.

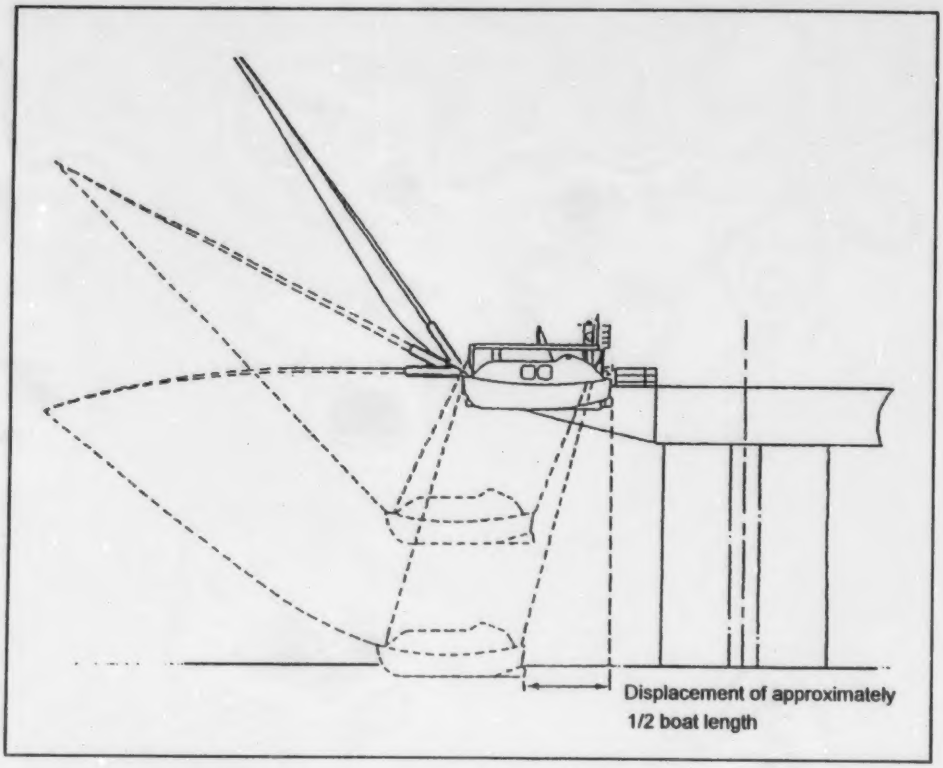


Figure 2.5 PROD system

When launching of the lifeboat commences (by conventional twin fall davit) the weight of the lifeboat creates tension in the line, resulting in the pole being drawn down. The tension is stored in the hydraulic hinge connecting the boom to the structure and in the flexible boom itself. The tension in the tag line has the effect of progressively swinging the boat's head away from the installation until it is about 45 degrees to the structure. During lowering the fall wires and tag line combine to stabilize the craft in high winds.

Once the craft is in the water, the engine throttle is opened to full ahead and the lift hooks are released. At this point the propulsion unit has attained maximum thrust and will be producing steerage way so that the boat can be manoeuvred safely, with a reduced chance of being swept back into the structure.

A variation of the PROD construction allows the lifeboat to be positioned perpendicular to the platform rather than parallel to it, avoiding the twisting of the fall wires produced in the parallel system. In 1986 Husky/Bow Valley, in conjunction with Canadian authorities and industry, undertook full-scale trials from a semi-submersible deployed off the coast of Newfoundland. The trials evaluated different configurations to ensure the system was working within its design limitations. Although the weather was not particularly severe at the time, significant improvements using the PROD system were demonstrated. Therefore, for davit-launched systems, the use of a PROD system significantly enhances launch reliability. Data for 69 full-scale PROD launches conducted by Husky/Bow Valley were compiled and analyzed as part of this project. Both simulation time parameters and some reliability data were extracted for the RPT. The PROD system was developed by the Sussex company Watercraft UK and is certified by the Canadian Coast Guard.

- *TEMPSC Orientation and Evacuation System (TOES)*

The TOES system, as shown in Figure 2.6, is designed to orient and tow the standard survival craft away from a platform during emergencies. It relies on the stored energy of a submerged buoy to provide directional towing force to the lifeboat during its launch. The buoy is linked to the lifeboat by a steel cable running through a hoop implanted in a concrete anchor block in the seabed. The cable is kept close to the installation by a hook/eye near sea level, which automatically disengages when the lifeboat is launched.

The buoy rises and, via the cable, applies a controlled force to the bow of the lifeboat, gradually rotating it away from the installation. Once the falls are disconnected the boat moves to a position directly above the anchor block, where it is effectively moored. The boat can either remain in that position facing the weather or it can be released to motor away.

TOES was developed by Chevron UK and EM&T, and may easily be retrofitted. It is a recommendation of this study that further work be carried out on the benefit of using a TOES system to enhance launch reliability.

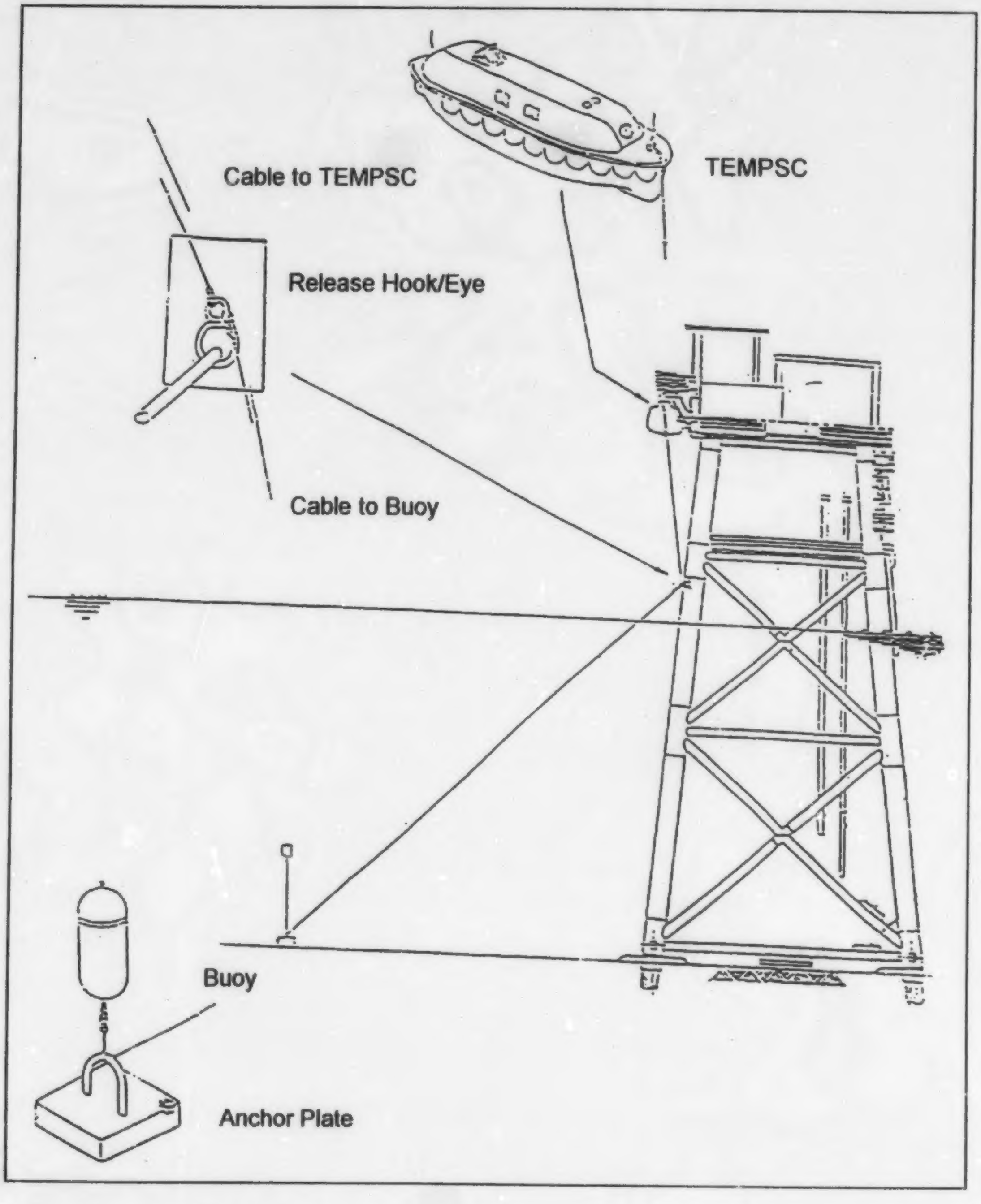
- *The Power Dolphin system*

The Power Dolphin system is also intended to help propel the lifeboat away from the platform by towing it with an automatic battery-powered torpedo-shaped device, the Dolphin. The Dolphin is housed in an inclined launching ramp attached to the installation. When the survival craft commences lowering from the davits the Power Dolphin is automatically started and released. The Dolphin free falls to the water below, following a shallow trajectory and quickly resurfacing, proceeding away from the installation at high speed on its predetermined track controlled by the automatic pilot.

The towline continues to pay out until the Dolphin is approaching 1.5 times the distance the survival craft was stowed above the waterline. At this point, tension will operate a reeling gear in the Dolphin, pulling out further line from the pulleys against the resistance of the shock cords and in this process, storing energy.

As soon as the Totally Enclosed Motor Propelled Survival Craft (TEMPSC) is waterborne and its lifting hooks released, it is accelerated away from the installation by the Dolphin, assisted by the increasing thrust of its own motor. The Dolphin will assist with the propulsion of the TEMPSC until its battery is exhausted (six minutes).

No detailed study has been made of its likely performance and it appears that the system is no longer being marketed.



Cable to TEMPSC
TEMPSC
Release Hook/Eye
Cable to Buoy
Buoy
Anchor Plate

Figure 2.6 TOES system

- *Survival Craft Anchored Tow (SCAT)*

SCAT has been especially designed for shallow water installations. It operates with a fixed cable connected to the rig close to the water level, and its other end is anchored to the seabed some distance out and tensioned to form a suitable incline. A tow cable is connected to a lifeboat via a quick-release mechanism operable from inside. The other end of the tow cable is connected to a tow weight, which can slide down the fixed cable. On lowering the lifeboat in the conventional way, the tow weight commences to run down the fixed cable away from the rig, towing the lifeboat behind. Once the lifeboat is released from the falls, the tow continues away from the installation until the weight reaches the seabed. Because SCAT is still in its infancy, no information on actual usage was located.

Free-fall lifeboat systems

Free-fall boats were developed as a more rapid means of evacuating offshore installations, with fewer critical failure modes than davit-launched lifeboats, as well as providing initial impetus away from the installation. Vertical drop and skid-launched free-fall systems are currently in operation.

Free-fall lifeboats may be safely launched through fire on the sea surface. Extensive training is required to familiarize crew with many new concepts. One downside is the potential for striking debris on launch causing damage to the lifeboat. Although free-fall lifeboats are the most reliable evacuation method, their effectiveness is not currently documented in emergency situations or severe weather. Full-scale test data on free-fall lifeboat boarding and launches were collected and incorporated in the RPT as part of this project.

- *Vertical drop*

The vertical drop free-fall boat (illustrated in Figure 2.7) was originally developed specifically for offshore installations with large deck heights. The angle between lifeboat baseline and horizontal when the lifeboat hits seawater (water entry angle) is nearly the same as when the lifeboat is released. This method is largely insensitive to wind, with the boat providing positive headway due to its shape. Initial forward momentum away from the platform is about 10 knots for various trim/list ratios and severe wind.

Two persons are required to release the free-fall hook, both sitting in the boat. The system requires a free space directly below the lifeboat installation. As a result of current design improvements, behaviour in heavy seas is good.

- *Skidfall*

This system (see schematic shown in Figure 2.8) was originally developed for merchant ships with moderate freeboards. When released from the stowed position, the lifeboat starts to glide down the skid. Both vertical and horizontal movements are introduced. At the moment when the lifeboat is leaving the skid, rotation is introduced. This rotation will provide the lifeboat with the final water entry angle. It is very important that the water entry provide headway and acceptable acceleration forces. In extreme wind conditions the wind may cause the lifeboat to rotate, thereby resulting in unfavourable water impact. A well-founded testing program is necessary to define the operational limitations with reference to installation height and degrees of trim/l

Figure 2.7 Vertical drop boat (courtesy of Umoe Schat-Harding)

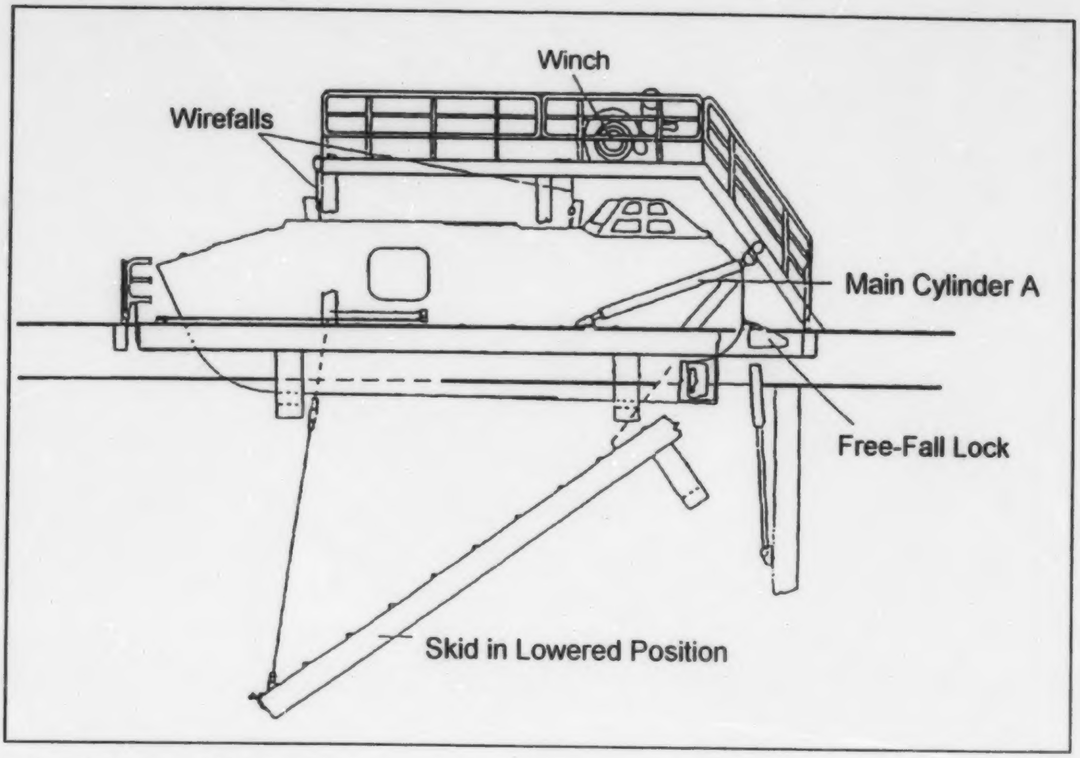


Figure 2.8 Skidfall boat

Normally the lifeboat and skid are positioned at 30 to 35 degrees, which provides easy boarding. The launching arrangement has its own lifting frame, which may be rotated outward to pick up the lifeboat. There is no requirement for open space directly below the lifeboat installation.

Arctic evacuation systems

Individual evacuation systems suitable for both ice-covered and open water conditions require development. However, two types of lifeboat adaptations, the ARKTOS and the IRT, are described below.

- *ARKTOS*

To date, the only operating system suitable for on ice, broken ice, and limited open water operation is an amphibious tracked vehicle called the ARKTOS system shown in Figure 2.9.

- *Ice Resistant TEMPSC (IRT)*

Various adaptations to conventional lifeboat launch and ice adaptations are in the design stage, as described by Bercha [16, 17, 18, 19]. Figure 2.10 shows a telescoping boom launch mechanism operated from a typical Arctic gravity-based structure (GBS) together with the IRT designed for on ice, broken ice, and open water operation.

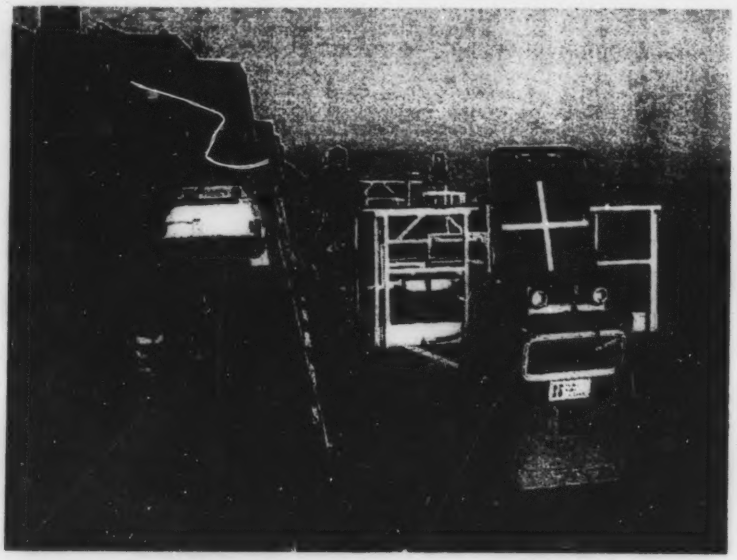


Figure 2.9 ARKTOS system

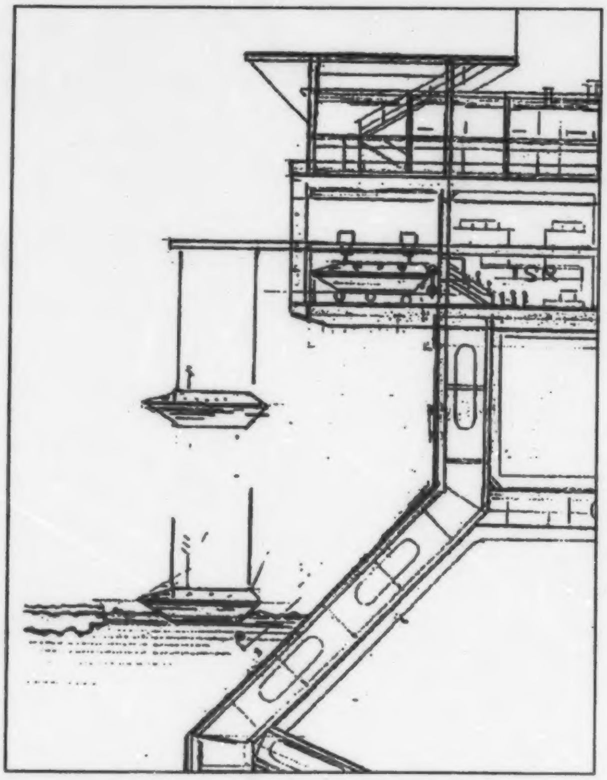


Figure 2.10 Telescoping boom launch IRT mechanism

Seascape

Seascape consists of a computer-controlled deployment arm supporting a modified TEMPSC. The TEMPSC is mechanically pivoted during launch so that zero degree trim can be maintained. The deployment of the system is controlled by a cable extending to a winch on the rig. Further information on the Seascape system requested from Seascape Systems Ltd. of Newfoundland is pending at the time of completion of this report.

2.6.3 Mass Evacuation Systems

Liferafts

This is an alternate system on most platforms and is considered to be the conventional alternative to lifeboats. Liferafts are well known and covered by SOLAS [36] rules for design and testing. A recent addition [36] to the existing SOLAS requirements states that liferafts shall be self-righting.

- *Davit-launched liferafts*

The raft is lowered to the sea surface by a single wire with a hook connection to the raft. Davit-launched liferafts encounter release problems similar to those of davit-launched lifeboats (i.e., failure to release or release at height). The moment the craft encounters the sea is critical. If a breaking wave hits the raft, it may cause evacuees to be thrown into the sea. It takes approximately two minutes to inflate each raft, one minute to secure it, five minutes to embark and 10 to 15 seconds (depending on distance) to lower to the sea surface.

Rafts are sensitive to wind forces both during launch and once on the sea. Wind may induce pendulum motion while the raft is descending and tends to move the liferaft in a downwind direction when on the sea. Rafts are prone to capsize in wind and weather when the number of persons on board is substantially below the carrying capacity. An illustration of a davit-launched liferaft is shown in Figure 2.11.

- *Quick-release liferafts*

Liferafts are occasionally installed on free-fall launching skids to allow quick release of liferafts to the sea. Liferafts inflate at depth and surface providing refuge for persons already in the sea. A liferaft painter may be attached to the installation to ensure that the raft does not drift while unmanned. The same problems with quick-release liferaft operation are experienced as those outlined above.

- *Offshore Dry Evacuation Lifesaving Equipment (ODELE)*

ODELE is operated by three persons. It can be launched either by conventional davit or simply thrown overboard. The craft, made from natural rubber, can carry up to 20 evacuees and meets SOLAS regulations. ODELE was developed by Dunlop Marine Safety Division.

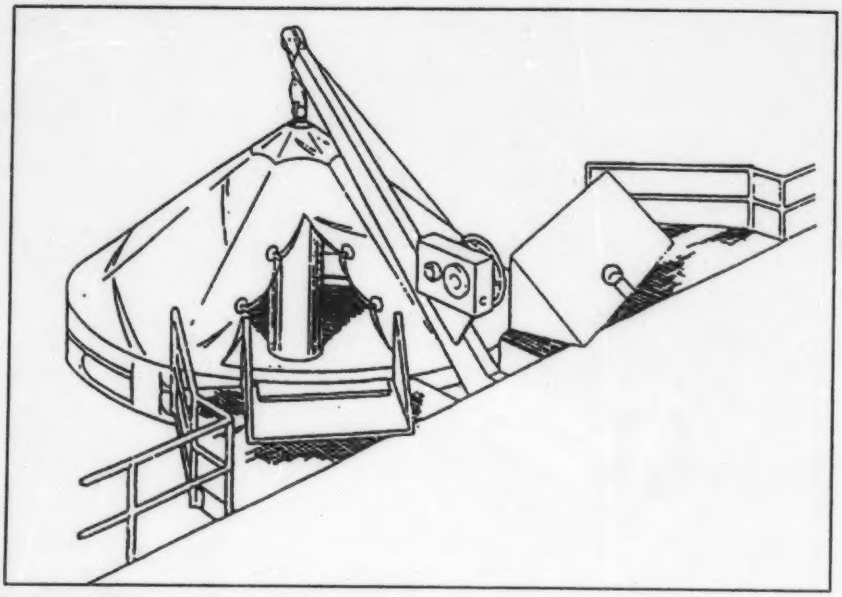


Figure 2.11 Davit-launched liferaft

Gondolas

The Gemevac system works on the cable-suspended gondola principle used by the Royal Navy for transferring supplies between vessels at sea. Gemevac may be described as a cable car arrangement capable of transporting a number of persons in a two-ton gondola, which runs along two steel cables suspended between the installation and a standby vessel not more than 70 m away.

The standby vessel requires a special mast for the linkup to ensure that the capsule clears high waves in rough weather. Personnel on the platform use compressed air to shoot a line to the standby vessel, and subsequently string three cables to link platform and vessel. The cables require 15 to 20 minutes to fully install.

The gondolas are standard spherical, enclosed, 16-man Whittaker capsules designed to be lowered from a platform to float in the sea. They travel on two of the wires suspended between the rescue ship and the platform. The third wire gives control signals to the system, which automatically compensates for ship motion as the capsule moves between the platform and rescue vessel. Such a system may provide a backup to enable evacuation in serious incidents such as riser releases where the descent may be impaired.

The Gemevac system was developed by General Electric Company's Mechanical Handling division and it is claimed to be able to move 200 persons in 75 minutes under test conditions.

Escape chutes

Escape chutes are generally expandable tubular devices that allow evacuees a controlled descent to sea level, usually to an inflated raft. Chutes and collapsible stairs have the advantage over fixed stairs or ladders because they may be positioned away from the installation – hanging from an overhang or cantilever. They also avoid the difficulties inherent in the use of knotted ropes. Escape chutes are generally lightweight and compact.

- *Skyscape (Selantic-Escape Chute)*

Skyscape is a chute that provides a simple method of transferring personnel from deck levels down to the sea. It is made from Aramid fibre materials for optimal strength based on fire-resistant characteristics. The cross section of the chute is elliptical. It is subdivided along its length into cells, and fitted with a speed-retarding slide. Special springs are mounted on the rings in such a way that a D-section opening is formed at the base of each cell.

The personnel slide down through these openings with the D-sections wide enough to allow personnel to wear life jackets, survival suits, breathing apparatus, etc. Injured personnel may be transported down the chute on special stretchers. Personnel can enter and exit the chute at any level through openings located behind each retarding slide. Personnel may also climb up inside/outside the chute. Grab handles are fitted to each ring.

The length of the chute is calculated to allow side motion due to wind and sea current. The stowage box is the structural interface for the chute to the platform deck. The chute is drop released by cutting a strap holding the stabilizing weight in the bottom of the stowage box. This releases the stabilizing weight, the floating element and the chute to form a corridor to the sea. A floating element is situated at the bottom of the chute. The floating element is an automatically inflated platform where escaping personnel can await rescue or transfer to a liferaft.

The system was tested by Statoil at its Statpipe riser platform in 1986 for a continuous 17 hours in 63-knot winds and wave heights up to 11 m. Various models are manufactured by Selantic: some with integrated liferafts and others with throw-over liferafts. A Skyscape schematic is shown in Figure 2.12. Detailed performance tests are described in Chapter 4 of this report.

Full-scale tests, described in subsection 4.2.4, were performed as part of this project to evaluate human performance parameters for the Skyscape.

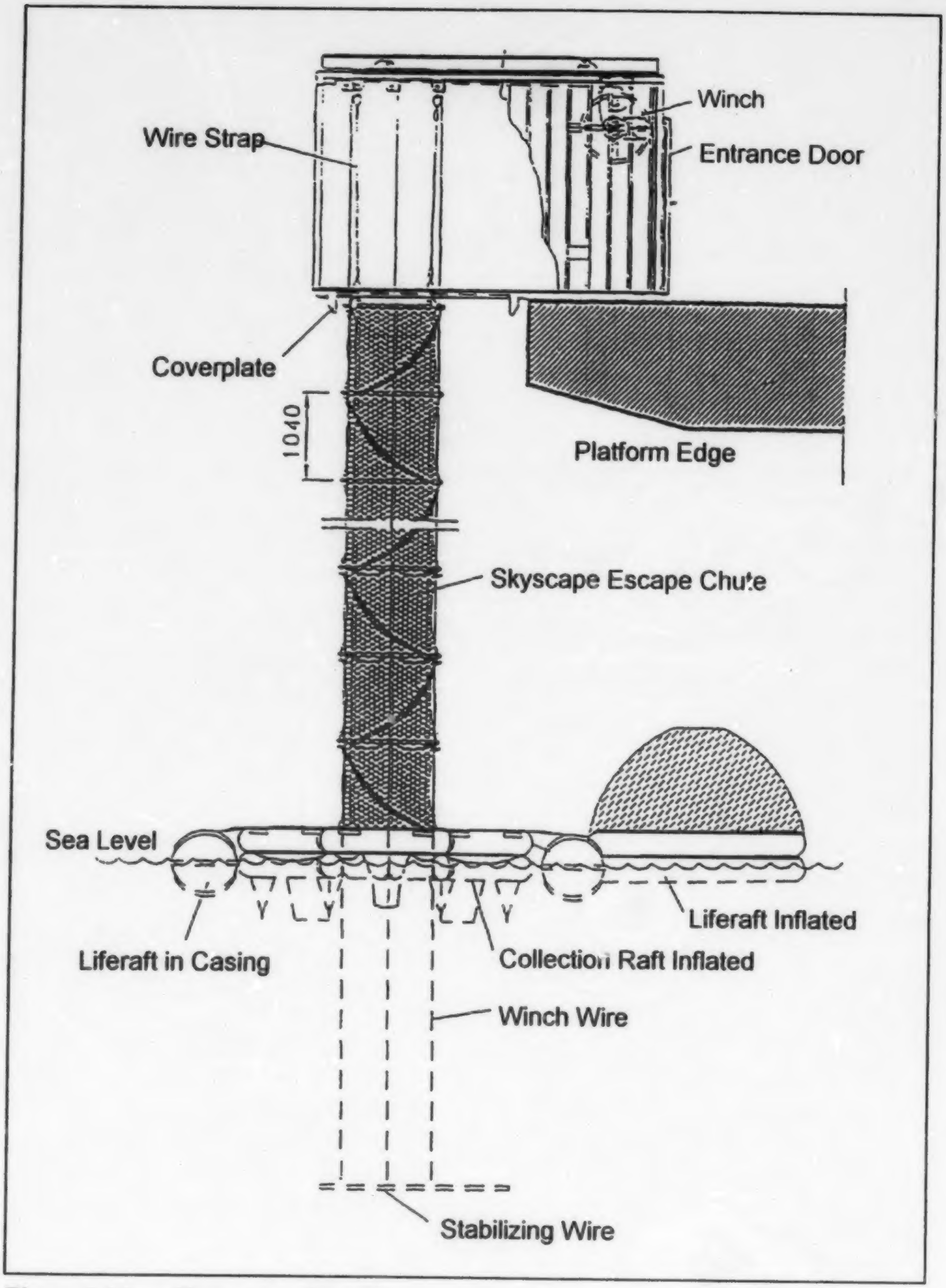

Winch
Wire Strap
Entrance Door
Coverplate
1040
Platform Edge
Skyscape Escape Chute
Sea Level
Liferaft Inflated
Liferaft in Casing
Collection Raft Inflated
Winch Wire
Stabilizing Wire

Figure 2.12 Skyscape schematic

- *Inflatable chutes*

These work on the same principle as the escape slide systems used in airliners. A drum-shaped container holds the inflatable parts in a single compact package on the apron assembly. When released, the container rolls off the cradles with one half falling to the left side and the other to the right side. A tether line attached to one half is connected to the main air supply valve. The impact of the falling container actuates the air valve to initiate the inflation sequence automatically.

The inflatable multi-tubular slide is constructed of high-strength, durable nylon fabric coated with neoprene elastomer. At the lower end a special deceleration surface slows down the evacuees as they prepare to enter the attached life raft. The underside of the slide is fitted with a pneumatic truss, which increases stiffening of the entire unit and prevents bending and sagging under large loads.

Each escape system incorporates an inflatable life raft joined to the lower end of the slide by a quick release restraint device. Release is accomplished instantaneously by pulling a lanyard at the end of the slide after evacuees are safely in the raft, which is automatically inflated on deployment of the chute.

Collapsible stairs

- *Selantic Offshore Access system*

The Selantic Offshore Access System is a collapsible spiral staircase that folds into a compact storage unit. The system is deployed by a hydraulic winch and may be brought into a 'parked' position within minutes. The lower section of the staircase contains a flexible stair-zone to accommodate sea conditions. This system is available in cantilevered or bridge mode.

- *SDSC safety system*

This system operates in a manner similar to lowering a concertina of conventional scaffold staircases. The multilevel, collapsible stairway is stowed folded below its launch point at a fixed platform and davit assembly. On release it provides a stairway to water level in 2.4-m stages and deploys inflatable liferafts. All-weather operating ability is claimed. It was developed by a subsidiary of Scaffolding Design and Safety Consultants and was submitted for Lloyd's approval. No further information was located on this system and it is unknown whether it is being marketed.

- *Gotech escape stair system*

This system of stairs is lowered through a system of synchronized support wires. As the base descends successive flights of stairs interconnected to landings are erected by chain hangers. A water-drenched three-sided fire screen can also be provided. Inflatable life rafts are stowed on the base platform and a weighted scramble net is also attached to the base platform. The base platform is held well clear of the sea surface to reduce the wave effect and joints are articulated to minimize stresses at these connections. No further information was located on this system and it is unknown whether it is being marketed.

Bridges

Gangways either telescopic or articulated provide another option for walking off platforms. These may either be installed on the installation or the standby vessel.

One ship-based system known to be in existence utilizes a sophisticated computer-controlled telescopic gangway that does not need to be fixed to the platform to enable evacuation to take place.

Platform-based systems consist of extended gangways or hinged fixed-length gangways. Extended gangways are rotated out and a pickup line is fixed to the rescue vessel. This pulls over the cables that support a flexible gangway. The cables are connected to a constant tension winch on the rescue vessel to allow for movement. Hinged fixed-length gangways are hinged to be stowed alongside the installation structure. At the end of the gangway, scrambling nets, chutes, or friction fall devices are fitted. Evacuees can then descend either onto a rescue vessel or into the water.

- *Flexitrans*

United Fabricators of Norway has developed a telescope bridge/tunnel called the Flexitrans system. Flexitrans has a maximum outreach of 65.7 m, which may be extended to connect with a support vessel. The tunnel is made from extruded aluminum profiles arranged in circular cross sections and equipped with lighting, sprinklers, non-slip walkways, and handrails.

- *Safelink gangbridge*

Anker Consult of Frederikstad built this hydraulically operated gangbridge for gaps of 15 to 35 m between floating structures. The bridge telescopes out to the target vessel. This system saw limited experimental service on the Sedco Phillips SS in 1984 but had technical problems. It has subsequently been involved with Statoil and Petrobras in Brazil. No further information was located on this system and it is unknown whether it is being marketed.

- *Safeway*

Kvaerner Brug has developed a jointed gangway or bridge designed to allow personnel to walk away from an emergency directly onto a standby vessel. The Safeway system is a hydraulically operated bridge that has three gangway sections and a central elbow, and cantilevers out from a slewing derrick. The system is designed to move freely in both horizontal and vertical planes over a radius approaching 30 m at sea level and is claimed to operate in wave heights up to 16 m. No further information was located on this system and it is unknown whether it is being marketed.

Ladders and stairs

Permanent ladders and stairs are frequently placed strategically at the corners of installations to provide access to below deck areas for inspection and also as potential escape routes for direct access to the sea.

Scrambling nets and knotted ropes

Knotted ropes, scrambling nets and (wire) rope ladders are very basic means of descent to the sea and have commonly been placed in strategic locations as potential escape routes. Knotted ropes and scrambling nets are preferred in the UK, while (wire) rope ladders are preferred in Norway.

Rope descent devices

- *Donut rapid evacuation system*

Donut comes in a handbag-sized package containing a nappy harness and a reservoir of tape that passes through a descending device. In an emergency, the tape is simply clamped onto any convenient anchor point and the evacuee abseils down to wait at a safe level above water, releasing at will.

The Donut system was developed by Aberdeen company Engineering Management and Inspection (EM&I), with support and guidance from the UK Departments of Energy and Transport as well as oil companies.

- *Surescue*

The system consists of a fixed davit with a rope leading down to sea level. Resembling a ski lift tow bar, Surescue comprises a descent control unit, rope, clamp, 'chair', and lanyard.

It works on the principle of a chair-lift evacuation. The escape line is stored and fed from a storage reservoir. This line passes via a descending device unit through a swing arm davit to the lower level escape point.

Each evacuee attaches his or her chair to the davit suspended rope using the clamp and swings into position, steadying the chair with the lanyard. Once the lanyard is released, descent is continued (2.5 m/s) and automatic. Ideally descent is to a boat or raft rather than directly into the sea.

As shown in Figure 2.13, the system can only accommodate one person at a time. Surescue was developed by Perry's, a Merseyside-based company.

Chain evacuation system

This consists of a continuous loop of chain from the platform to the sea surface. Holding blocks are positioned at intervals allowing evacuees to simply step off the platform, grab a block on the chain, and be lowered to the sea. There is a braking system employed on the chain to allow controlled descent. The system is housed in a weathertight container and once the chain is lowered, the system is available for use.

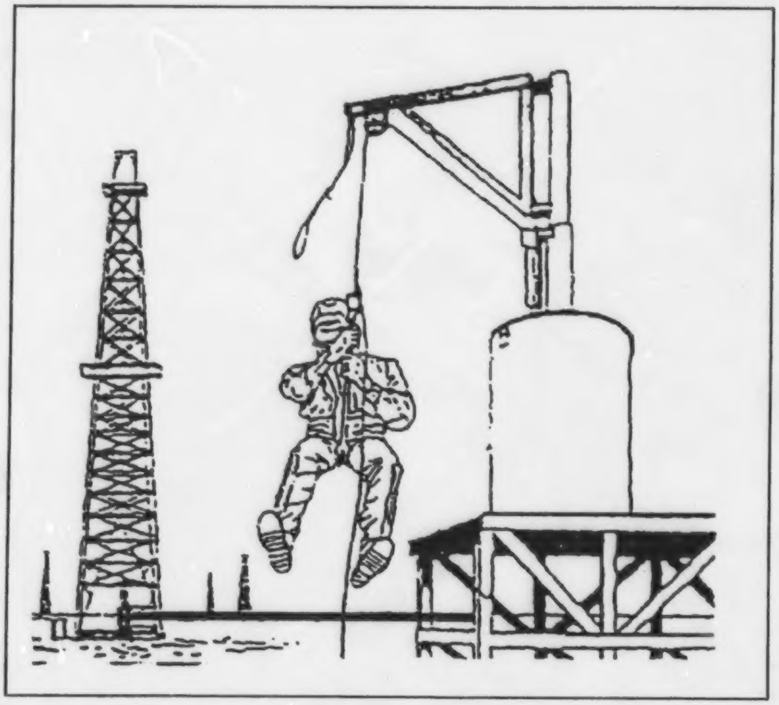


Figure 2.13 Surescue escape system

3. EER RISK AND PERFORMANCE TOOL DEVELOPMENT

3.1 Introduction and Background

3.1.1 General Introduction

One of the main objectives of the work entailed the development of an RPT capable of assessing the risk and reliability performance characteristics of different escape, evacuation, and rescue components, and their integrated performance as an EER system for different East Coast installations. This chapter describes the functional software system developed to fulfil the requirements of Task 3, the final form of the RPT [7, 8] – including online Help and screen optimization – and the validation work conducted under Task 4.1.

3.1.2 Introduction to EER

Reliable EER could have averted or reduced the catastrophic casualty consequences of marine disasters such as the Alexander Kielland, Ocean Ranger, and the Piper Alpha. This statement automatically gives rise to two questions. What is reliable? Could reliable EER really have helped? The initiating events for the above disasters were neither unexpected nor unpredictable, although they were serious. The Piper Alpha marine disaster [29, 53] was initiated by a relatively small maintenance-related gas leak, which rapidly escalated to encompass the entire installation; emergency procedures are well established for maintenance activities. In the case of the Ocean Ranger [22], a severe storm caused the unexpected loss of ballast system control, which escalated to a loss of stability and relatively rapid catastrophic sinking. Again, the design limits of the structure were not exceeded in the environmental conditions that initiated the disaster.

So how could one have predicted what applicable and successful EER process could have been in place for these cases? Undoubtedly, these installations had well established emergency response plans and conducted drills, including unannounced (surprise) escape and evacuation drills, on a regular basis. Unfortunately, no matter how realistic drills under non-emergency conditions are, they fail to simulate a real accident situation. Behaviour of personnel in an emergency, together with the stochastic nature of some of the parameters – including the accident damage, environment, and personnel response conditions that affect the escape, evacuation, and rescue process – cannot be simulated in drills. Mathematical modelling, however, is able to incorporate any accident and personnel response conditions, bounded only by our engineering and operational imaginations. No event is too small, too large, or too complex to be simulated, provided the basic steps are set out in a rational and logical manner and strict discipline using accepted simulation techniques and empirical bases is adhered to.

In the balance of this chapter, following this general introduction, the basic steps of EER modelling are set out, followed by descriptions and representative results of EER analyses.

3.1.3 Basics of EER Modelling

The principal steps of EER modelling are illustrated in the block diagram in Figure 3.1. Essentially, following data compilation (Task 1) and assessment of the key accident scenarios (Task 2), the modelling of the escape process (Task 3) is conducted. The escape process entails movement of personnel from their location at the time of the alarm to a Temporary Safe Refuge (TSR). The evacuation process (Task 4) entails movement from the TSR to a lifeboat or other device, and its launch and movement to a safe distance from the installation. Task 5 involves the rescue model, which takes into consideration the environmental conditions, available rescue modes such as helicopters, standby vessels, and other ship traffic, and nearby land or harbour locations. In the final step (Task 6), the results of the individual component models are integrated to give an overall EER reliability of success probability rating for the emergency systems. A simplified schematic of this workflow is shown in Figure 3.2.

3.1.4 Escape Modelling

A three-dimensional drawing or electronic representation of the escape routes is initially used to provide an understanding of their spatial distribution as illustrated in Figure 3.3. Characteristic escape parameters such as those given in Table 3.1 are then used to assess the unit rates of progress, which may be expected for different numbers of personnel along escape routes.

Escape route configurations must be considered in conjunction with accident zones of impact, which may be superimposed on escape routes as illustrated in Figure 3.4 for a jet fire emanating from the production area in part of the complex. Alternatively, accident effects may be estimated and routes selected to avoid them.

Clearly, personnel not immediately affected by the accident would avoid escape routes within the high thermal footprints on the west side of the platform and would be restricted to routes on the east side, interconnected vertically as shown in the isometric view in Figure 3.3. Logical application of the unit parameters (Table 3.1) to an appropriate configuration of escape routes considering the initial locations of personnel throughout the installation can then be used as a basis for computation of expected times to the TSR, as summarized by corresponding histograms shown in Figure 3.5.

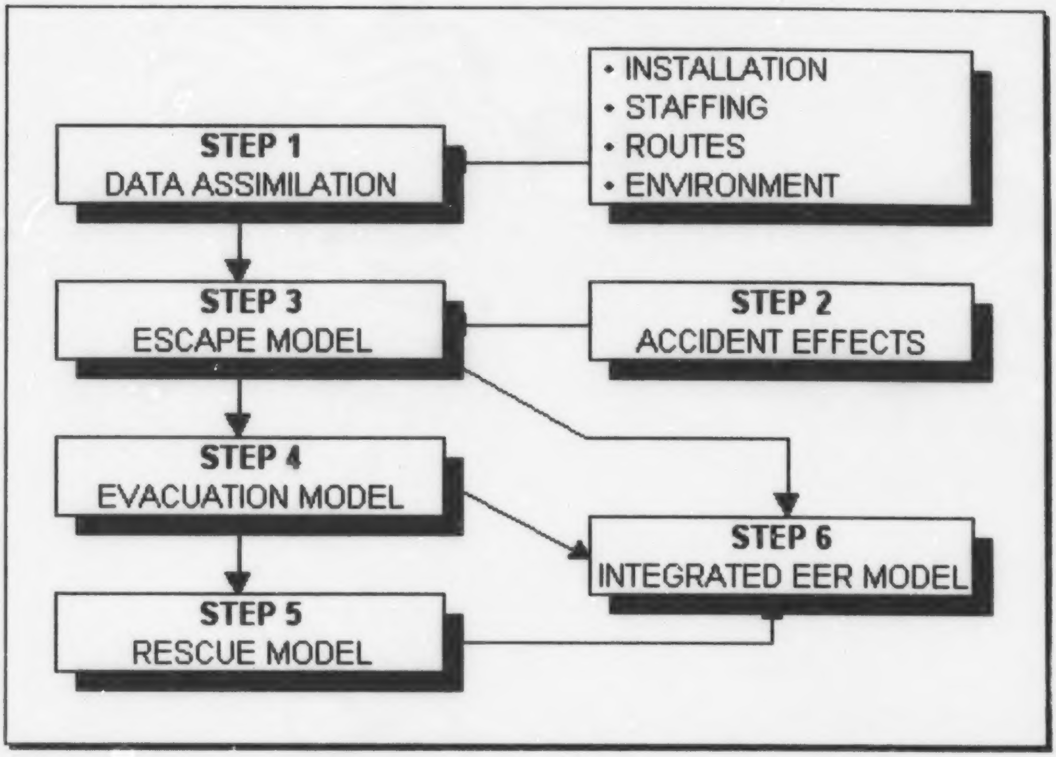

STEP 1
DATA ASSIMILATION
• INSTALLATION
• STAFFING
• ROUTES
• ENVIRONMENT
STEP 3
ESCAPE MODEL
STEP 2
ACCIDENT EFFECTS
STEP 4
EVACUATION MODEL
STEP 6
INTEGRATED EER MODEL
STEP 5
RESCUE MODEL

Figure 3.1 EER model schematic

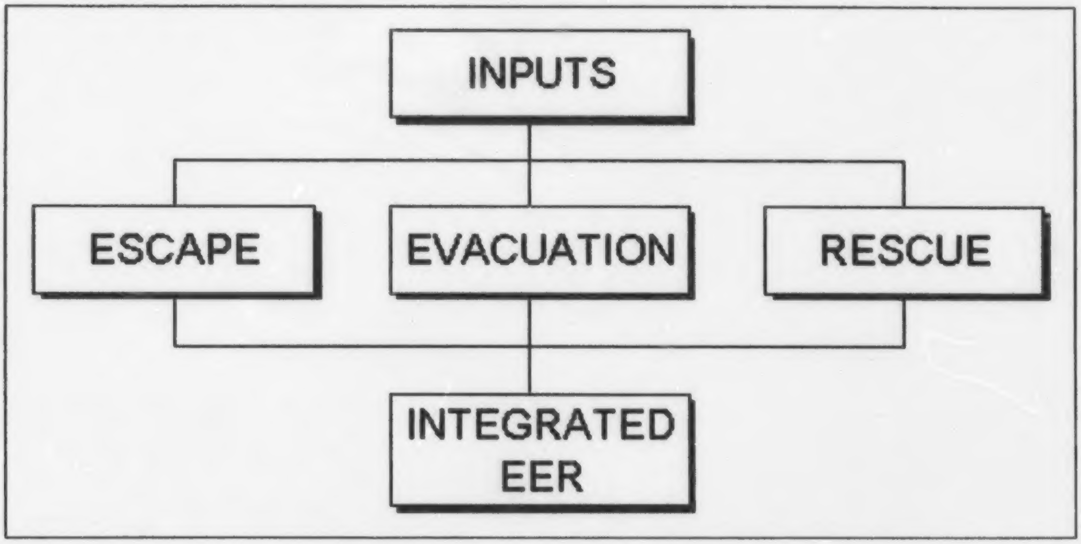

INPUTS
ESCAPE
EVACUATION
RESCUE
INTEGRATED EER

Figure 3.2 EER analysis schematic

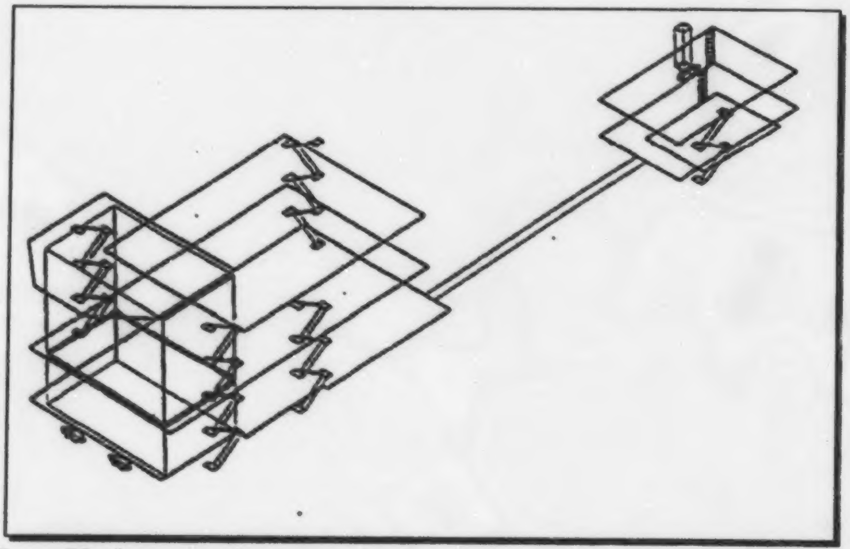


Figure 3.3 Platform complex isometric view

Table 3.1 Escape parameters

a) Delay Times

Personnel or Item	Delay (sec.)	Cause	Symbol
Catering/laundry staff	30	Reaction time	DTI
Personnel sleeping	150	Time to wake and dress	DTI
Crane driver	130	Assume suspended load to be lowered	DTI
Personnel in process modules	90	Time to make workplace safe	DTI
Drill crew	180	Time to make workplace safe	DTI
Personnel in workshops	60	Time to make workplace safe	DTI
All other personnel	10	Recognition of alarm	DTI
Bottleneck	10	Time to open door	DTB

b) Travel Speeds and Factors

Method / Impairment	Average Speed (ms^{-1})	Factor	
		Symbol	Value
External or internal walkway	1.0	-	1.0
Congested internal walkway (15-20 people)	0.6	CFW	1.7
Stairway	0.6	-	1.7
Debris impaired walkway	0.1	DF	10.0
In smoke (0 to 2.3%)	0.7	SF	1.4
In smoke (2.3 to 15%)	0.4	SF	2.5
In smoke (> 15%)	0.2	SF	5.0
Ladder	0.2	-	5.0
Under great stress/panic	0.6	PF	1.7

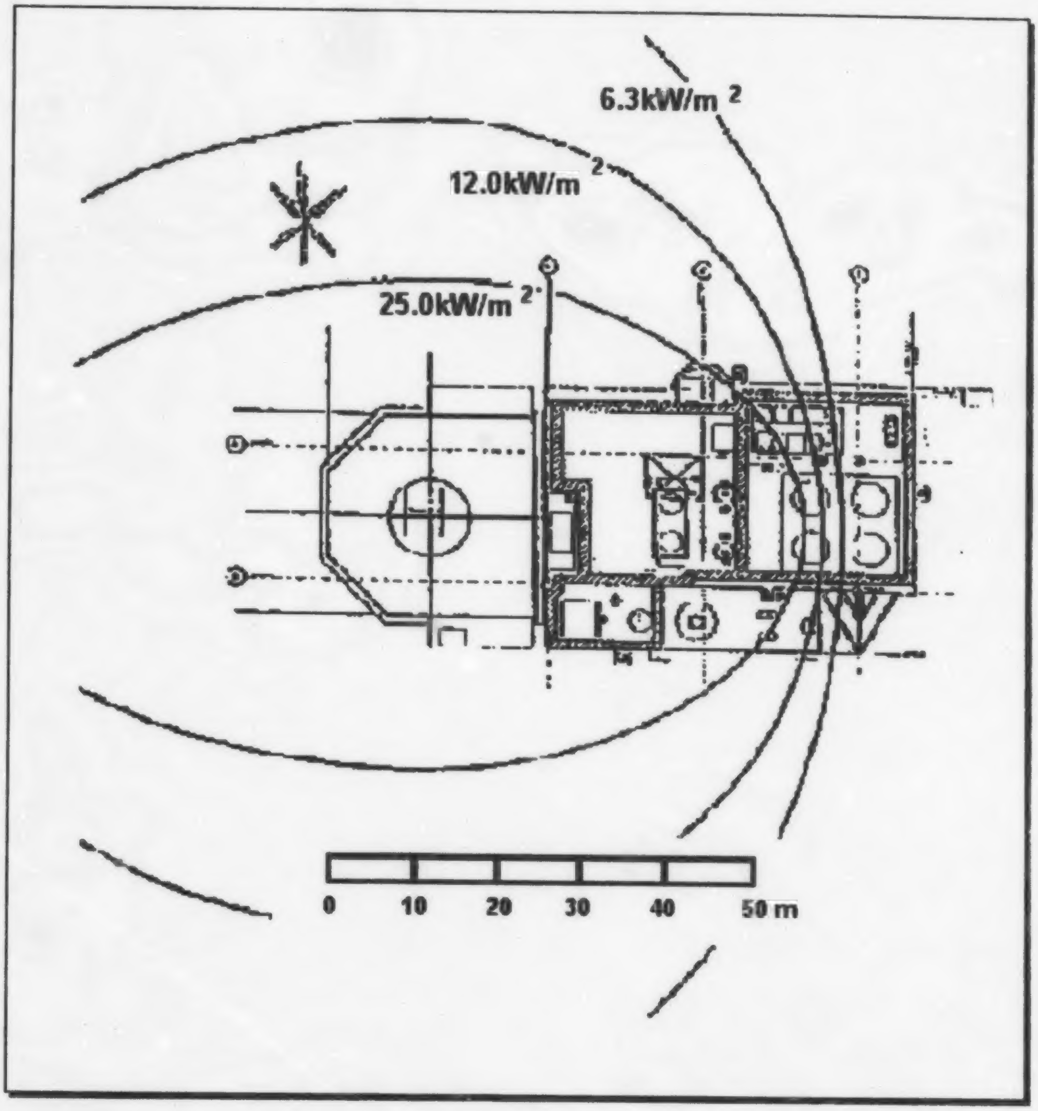
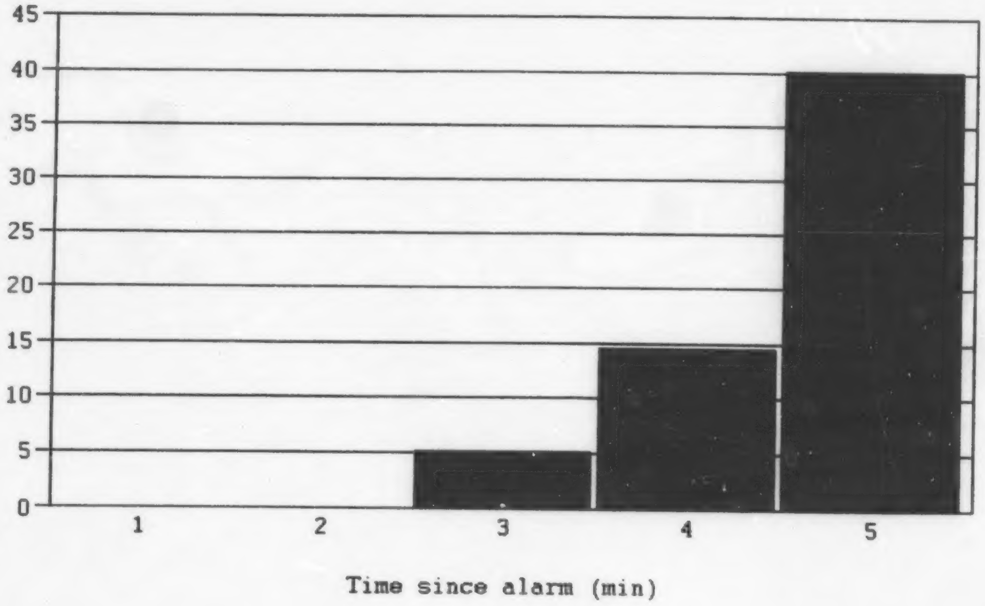
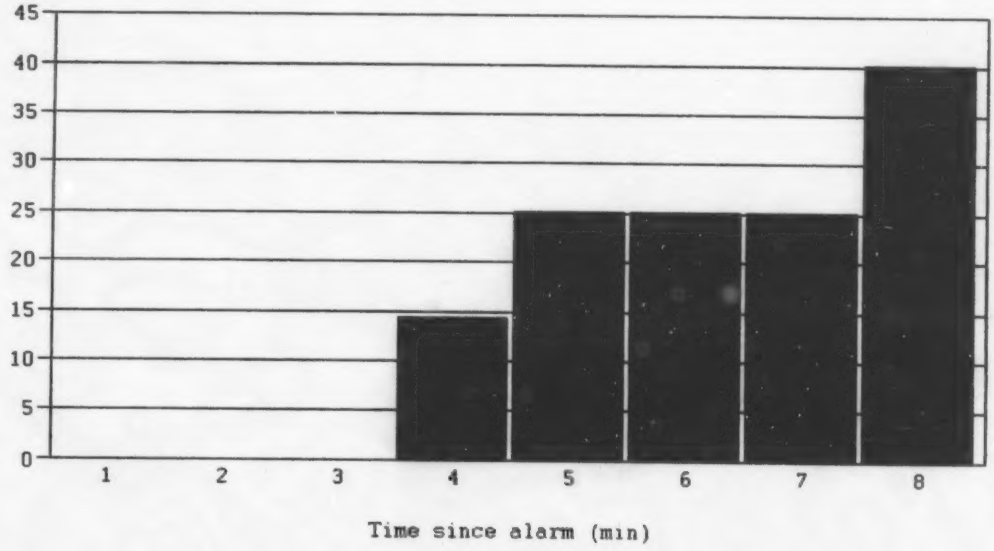

6.3kW/m 2
12.0kW/m 2
25.0kW/m 2
0
10
20
30
40
50 m

Figure 3.4 Thermal isopleths for westward jet fire



(T1H-40 POB)



(T1R-40 POB)

Figure 3.5 Muster to TSR during scenarios T1H-40 POB, T1R-40 POB

3.1.5 Evacuation Modelling

A similar approach involving probable unit times of component operations can be applied to an assessment of the evacuation process, which is the process of moving personnel from the TSR to a safe location clear of the installation. Unit evacuation parameters depend on environmental conditions. Evacuation success using a TEMPSC vary from a high of 98 percent for calm weather to a low of less than 10 percent for extreme weather conditions. The principal activities analysed for a typical TEMPSC evacuation may be summarized as follows:

- Preparation and roll call – 2 min.
- Movement of personnel from TSR to TEMPSC – 3 min.
- Lowering of TEMPSC to water surface – 2 min.
- Disconnecting of TEMPSC from lowering cables – 2 min.
- Movement of TEMPSC to location in water clear of platform – 2-4 min.

Typical success rate results of such evacuation modelling, averaged for weather conditions, range from 85 to 100 percent.

3.1.6 Rescue Analysis

Modelling of realistic rescue scenarios is the most complex step of the EER modelling process. For example, if the preferred evacuation mode by helicopter is not available, two principal evacuation modes, such as the TEMPSC described above, and a slide system (the Skyscape system) may be considered. A variety of outcomes to the TEMPSC or Skyscape liferaft evacuation were considered, together with different rescue modes including rescue helicopters, standby vessels, and travel to the nearest land (Sable Island). Alternative rescue scenarios can be represented for each principal weather condition by event trees such as that illustrated in Figure 3.6.

As can be seen moving from left to right in this event tree, the different options in the rescue process are identified together with their relative probabilities of occurrence. In the right hand column, the relative probabilities of success are given for each of the different rescue scenarios.

3.1.7 Integrated EER

Integration of the results from the escape, the evacuation, and the rescue assessment, together with probabilistic incorporation of the key environmental conditions, permits the generation of a reliability assessment of the entire emergency procedure. Table 3.2 shows such a summary for the platform under consideration, yielding an all-mode, all weather-weighted average of an 85 percent probability of success.

3.1.8 Outline of Chapter

Section 3.2 discusses the methodology associated with the work and introduces the structure of the program. Section 3.3 describes the form of the program, and Section 3.4 describes the validation phase.

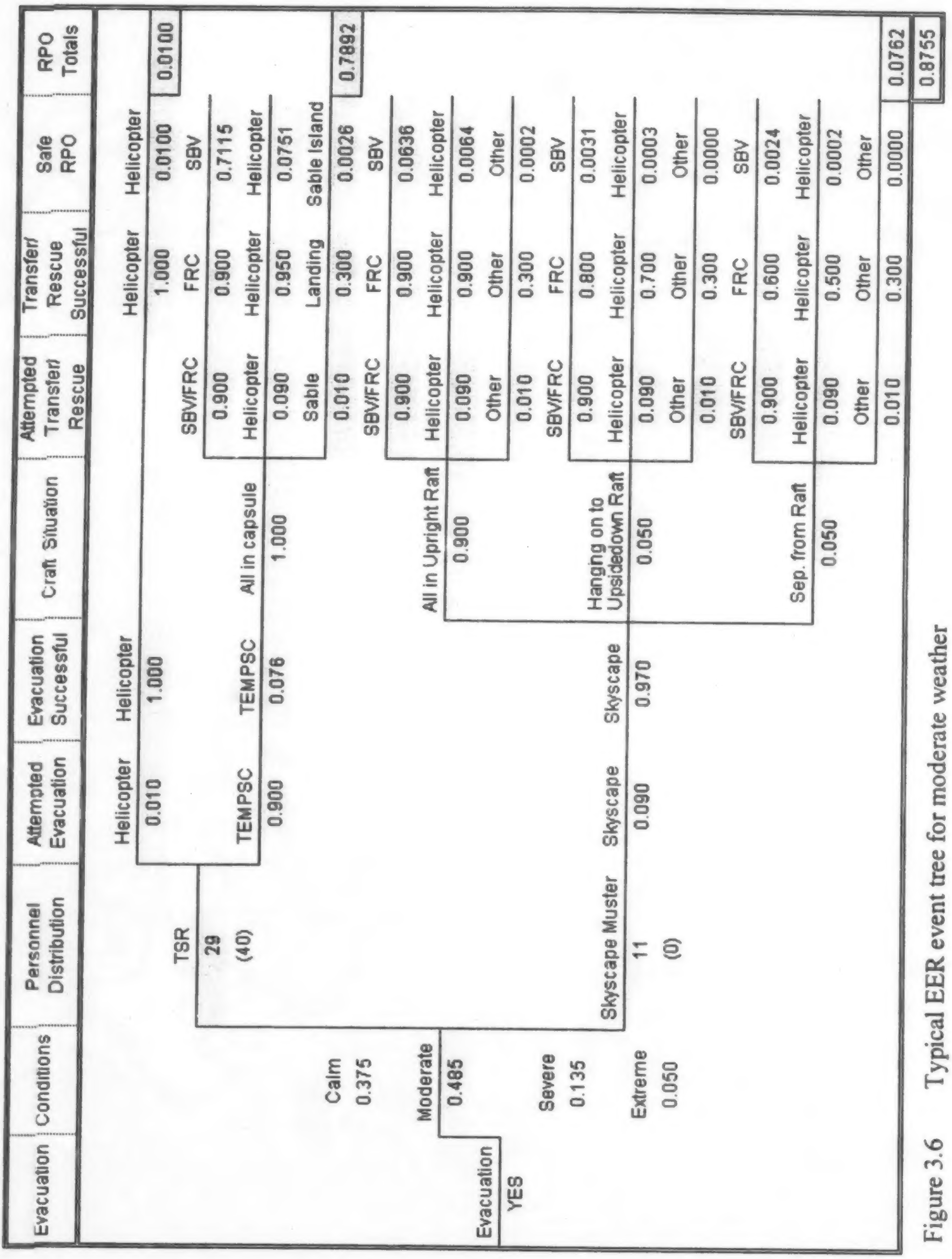

Evacuation
Conditions
Personnel Distribution
Attempted Evacuation
Evacuation Successful
Craft Situation
Attempted Transfer/ Rescue
Transfer/ Rescue Successful
Safe RPO
RPO Totals
Evacuation
YES
Calm
0.375
Moderate
0.485
Severe
0.135
Extreme
0.050
TSR
29
(40)
Skyscape Muster
11
(0)
Helicopter
0.010
Helicopter
1.000
Helicopter
Helicopter
1.000
Helicopter
0.0100
0.0100
TEMPSC
0.900
TEMPSC
0.076
All in capsule
1.000
SBV/FRC
0.900
FRC
0.900
SBV
0.7115
Helicopter
0.090
Helicopter
0.950
Helicopter
0.0751
Sable
0.010
Landing
0.300
Sable Island
0.0026
0.7892
Skyscape
0.090
Skyscape
0.970
All in Upright Raft
0.900
SBV/FRC
0.900
FRC
0.900
SBV
0.0636
Helicopter
0.090
Helicopter
0.900
Helicopter
0.0064
Other
0.010
Other
0.300
Other
0.0002
Hanging on to Upsidedown Raft
0.050
SBV/FRC
0.900
FRC
0.800
SBV
0.0031
Helicopter
0.090
Helicopter
0.700
Helicopter
0.0003
Other
0.010
Other
0.300
Other
0.0000
Sep. from Raft
0.050
SBV/FRC
0.900
FRC
0.600
SBV
0.0024
Helicopter
0.090
Helicopter
0.500
Helicopter
0.0002
Other
0.010
Other
0.300
Other
0.0000
0.0762
0.8755

Figure 3.6 Typical EER event tree for moderate weather

Table 3.2 Summary of EER results

Accident Location	Evacuation Mode			No. of People	RPO Totals				Navigable Weather Weighted Average	All-Mode All-Weather Weighted Average
Thebaud					Calm	Moderate	Severe	Extreme		0.8521
		Nav.	Ext.		37.5%	48.5%	13.5%	0.5%	99.5%	
	Helicopter	1.0%	1.0%	29 (40)	0.0100	0.0100	0.0081	0.0025	0.0097	
	TEMPSC	90.0%	98.0%	29 (40)	0.8768	0.7892	0.4490	0.0926	0.7761	
	Skyscape	9.0%	1.0%	11 (0)	0.0860	0.0762	0.0037	0.0005	0.0701	
	All Mode Totals				0.9728	0.8755	0.4608	0.0956	0.8559	

3.2 RPT Structure and Methodology

3.2.1 General Description of RPT

There are two principal approaches to the assessment of the reliability of a complex system such as marine evacuation system. The approaches are used to consider the combined reliability of all components in a specific EER system, for a specific installation, under specific operational, environmental, and technological conditions. These two approaches are simulation and risk analysis. In system simulation, a model of the continuous operation of different alternative operational modes of a system is used. Each operation, whether deleterious or not, is included in a simulation model. In risk analysis, on the other hand, only the errors or faults of a system are analysed, resulting in a failure probability or risk assessment. To properly understand the reliability of the operation of a system, it is desirable to combine both risk assessment and simulation modelling to obtain a complete picture of the system. Risk analysis is effective for the definition of failures or faults, while simulation is effective for modelling time sequences of different operations to provide an understanding of their interaction. However, simulation has limited application, simply for practical reasons, in definition of all the faults. To do this, a separate simulation path would have to be run for each of the possible ways in which a failure can occur. This is possible but not practical. Thus, risk analysis, which does not simulate the continuous operation of the system but rather is restricted to the analysis of errors or faults, is applied for the latter function – the modelling of system failures. An optimal combination of the two has been applied as a basis for the development of the RPT under this contract.

3.2.2 RPT Architecture

The architecture of the RPT generally follows the EER modelling structure described in subsection 3.1.3 and depicted schematically in Figure 3.1. Its transformation into high-level software architecture for the RPT is given in Figure 3.7. The principal analytical modules appear in the ovals and entail escape, evacuation, rescue, and integrated analysis. The global module is also included, but does not require analysis. As can be seen from Figure 3.7, there are four levels in the architecture as follows:

- Inputs
- Parameters
- Analysis
- Outputs

It is very important for the user to have a clear understanding of the definitions of these levels.

Inputs are the standard variables that are changed from run to run. Global inputs include variables such as the type of EER (drill, emergency, catastrophic), the number of people on board, the probability distribution of different weather severities, the type of installation, and the type of analysis (expected value or Monte Carlo). Although default values are built into the model for the inputs for each of the principal modules, they are normally changed for each run, which characterizes a different situation.

Parameters are risk and simulation quantities or factors that are predetermined in the model and not altered from application to application. Parameters for escape, for example, include such quantities as the rate of progress in metres per second of an average individual under drill conditions on an internal walkway. This is a simulation escape parameter. A risk escape parameter is the error rate that the individual under the same conditions would make when a decision is required to be made. Parameters, therefore, are characteristics of the model that are embedded in it and, from a practical point of view, are password protected so they can only be changed under special circumstances.

Analysis modules contain the expected value and Monte Carlo algorithms used to combine the parameters and inputs to produce the results or outputs. The analysis modules display the primary inputs, parameters, and results, but are also password protected, as changes in these are unlikely to be required from run to run.

Outputs give the principal results for each step of the EER process, as well as the integrated results for the entire EER process. The principal outputs given are time and success rate.

Time is the amount of time predicted for the subject activity, component, or EER process. Success rate is the probability that the subject activity, component or EER process can be carried out with no fatalities. Fatality rate, when it appears in the RPT, means the probability of one or more fatalities. For any given option, there is also a fatality ratio, which gives the proportion of personnel in that operation that are likely to be killed if that operation does not succeed. At this point of development, the RPT only predicts fatality rate. It is intended that the fatality ratio be included in future (if possible) so that probable loss of life can also be calculated.

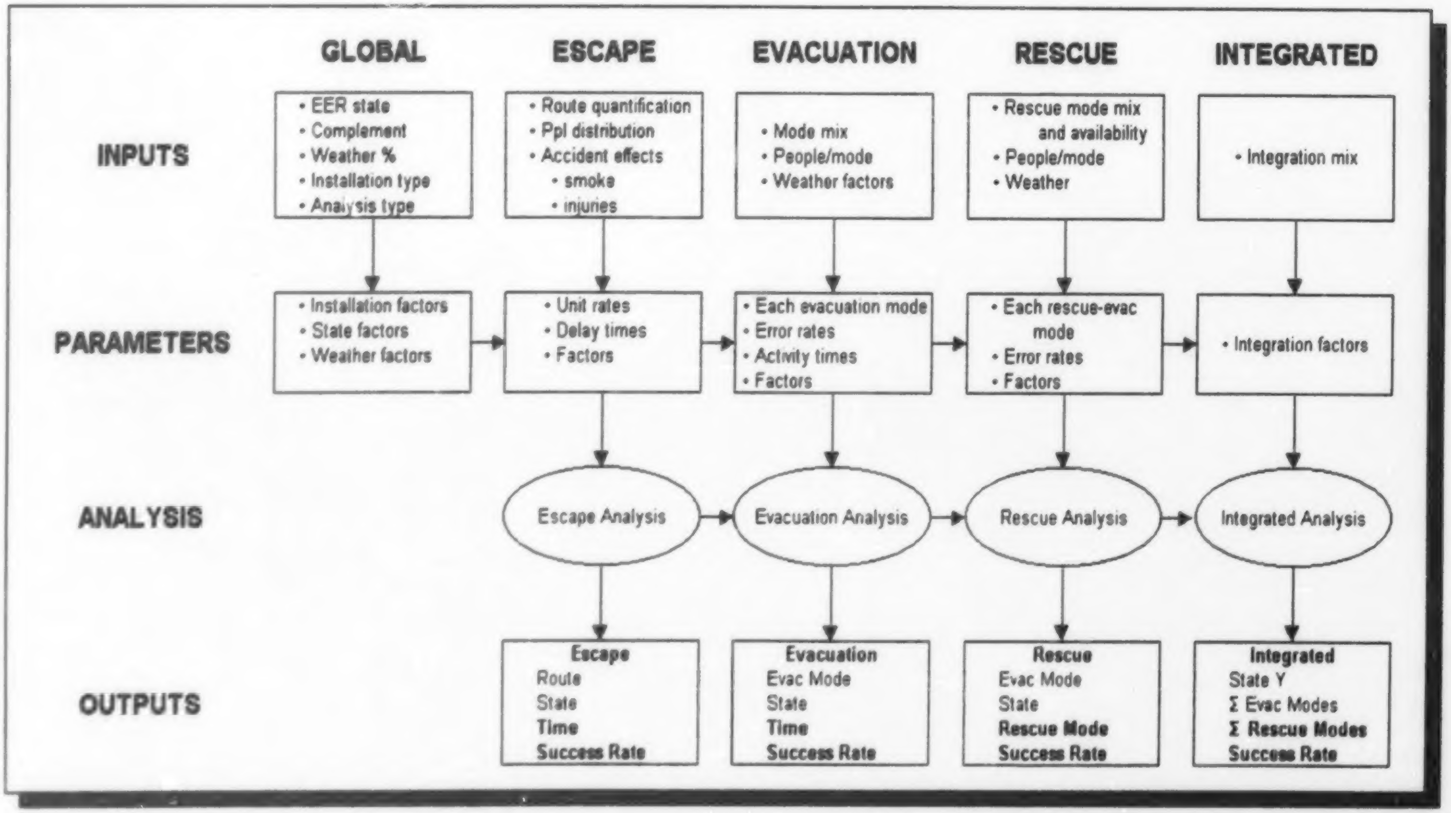

GLOBAL
ESCAPE
EVACUATION
RESCUE
INTEGRATED
INPUTS
• EER state
• Complement
• Weather %
• Installation type
• Analysis type
• Route quantification
• Ppl distribution
• Accident effects
• smoke
• injuries
• Mode mix
• People/mode
• Weather factors
• Rescue mode mix and availability
• People/mode
• Weather
• Integration mix
PARAMETERS
• Installation factors
• State factors
• Weather factors
• Unit rates
• Delay times
• Factors
• Each evacuation mode
• Error rates
• Activity times
• Factors
• Each rescue-evac mode
• Error rates
• Factors
• Integration factors
ANALYSIS
Escape Analysis
Evacuation Analysis
Rescue Analysis
Integrated Analysis
OUTPUTS
Escape
Route
State
Time
Success Rate
Evacuation
Evac Mode
State
Time
Success Rate
Rescue
Evac Mode
State
Rescue Mode
Success Rate
Integrated
State Y
Σ Evac Modes
Σ Rescue Modes
Success Rate

Figure 3.7 RPT high-level software architecture

Details of each of the modules and sub-modules depicted in the software architecture schematic will be given in the user manual.

3.2.3 Risk Analysis Methodologies

Approaches to risk analysis

Risk is a combined measure of the probability and magnitude of adverse effect [38]. Accordingly, risk analysis has the dual function of quantifying the probability or frequency of an undesirable event happening, and the magnitude or severity of its consequences. Translated into practical terms, risk within the EER context pertains to the probability that errors will be made, and that these errors will result in fatalities. Naturally, not all errors will result in fatalities during the evolution of the EER process. Similarly, as noted above, not all fatal (failed) events result in 100 percent fatalities. Accordingly, methods of combining the probabilities of errors, together with their likelihood of severity for different EER activities and conditions, were assessed. Although the RPT does not explicitly describe these methods in network form, they are based on the fault tree and Monte Carlo analysis described in the next sections.

Fault tree analysis

The basic symbols used in the graphic depiction of fault tree networks [1, 21, 22] are illustrated in Figure 3.8. As may be seen, the two types of symbols are logic gates and events. The basic fault tree building blocks are the events and associated sub-events, which form a causal network. The elements linking events are the AND and OR gates, which define the logical relationship between events in the network. The output event from an OR gate occurs if any one or more of the input events to the gate occurs. The output event from an AND gate occurs only if all the input events occur simultaneously. The inhibit gate shown in Figure 3.8 is located between a sub-event and a logic gate to define a constraint or condition affecting the resultant event. A conditional event as symbolized in Figure 3.8 is associated with the inhibit gate and identifies the event conditioning the input event. Both the sub-event and the conditional event must occur for the output event to occur. The inhibit gate is often used when an event occurs according to a demand; however, it can always be replaced by an AND gate.

In addition to the conditional event, three fundamental event types are identified in Figure 3.8. The resultant event follows from a combination of more basic fault events acting through logic gates. The basic event constitutes the bottom event of a fault tree and represents the limit of resolution for a particular analysis. If the fault tree is to be quantified, then reliability data must be available for each basic event. The undeveloped event is one identified for completeness of the analysis; however, further development of the event is not carried out because of a lack of information or because the associated results are not important for the analysis. The final event shown in Figure 3.8 is the subtree transfer. which is used to identify unique sub-branches of the fault tree that are repeated in various locations within the fault tree.

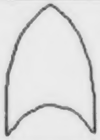
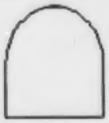
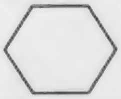
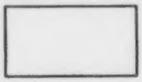
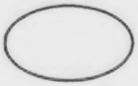
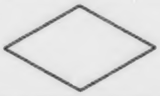
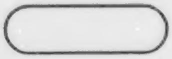
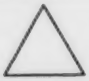
SYMBOL	DESCRIPTION
A. LOGIC	
	EITHER / OR GATE
	AND GATE
	INHIBIT GATE
B. EVENT	
	RESULTANT EVENT
	BASIC EVENT
	UNDEVELOPED EVENT
	CONDITIONAL EVENT
	SUBTREE TRANSFER

Figure 3.8 Basic fault tree symbol legend

The basic structure of a fault tree is illustrated in Figure 3.9. Because of their connection through an AND gate, Event D and Event E must occur simultaneously for the resultant Event B to occur. An OR gate connects Events B and C; therefore, the occurrence of either one or both of Events B and C results in the occurrence of the resultant Event A. As may be seen, the principal fault tree structures are easy to apply; however, the representation of complex problems often requires very large fault trees, which become more difficult to analyse and require more advanced techniques such as minimal cut-set analysis. For the present application, a smaller system connected through OR gates only will be examined. Such a system models a series reliability system adequately.

Fault trees may be used to develop joint probability functions for the evaluation of system failure frequencies and reliability characteristics. The frequency of occurrence for a hazardous top event may be calculated using fault tree logic to combine the frequencies of occurrence or probabilities associated with the base events. Top events may also be defined as failure events dependent on failure probabilities of sub-events. In general, personnel or system failure events may be classified as follows:

a. Failure during operation (continuous operation)
b. Failure to operate on demand (intermittent operation)
c. Operation before demand (intermittent operation)
d. Operation after demand to stop (intermittent operation)

Reliability or success is defined as the probability of not leaving the operational state before a specified time. Unreliability is therefore equal to the probability of failure. The following important concepts are encompassed in the definition of reliability:

a. Probability
b. Function of time
c. Function of failure definition

Reliability evaluations include the quantification of not only the top event parameters, but also those of different causal factors and failure modes, including human error. The process thus provides the basis for applying resources to the optimal areas to improve system reliability.

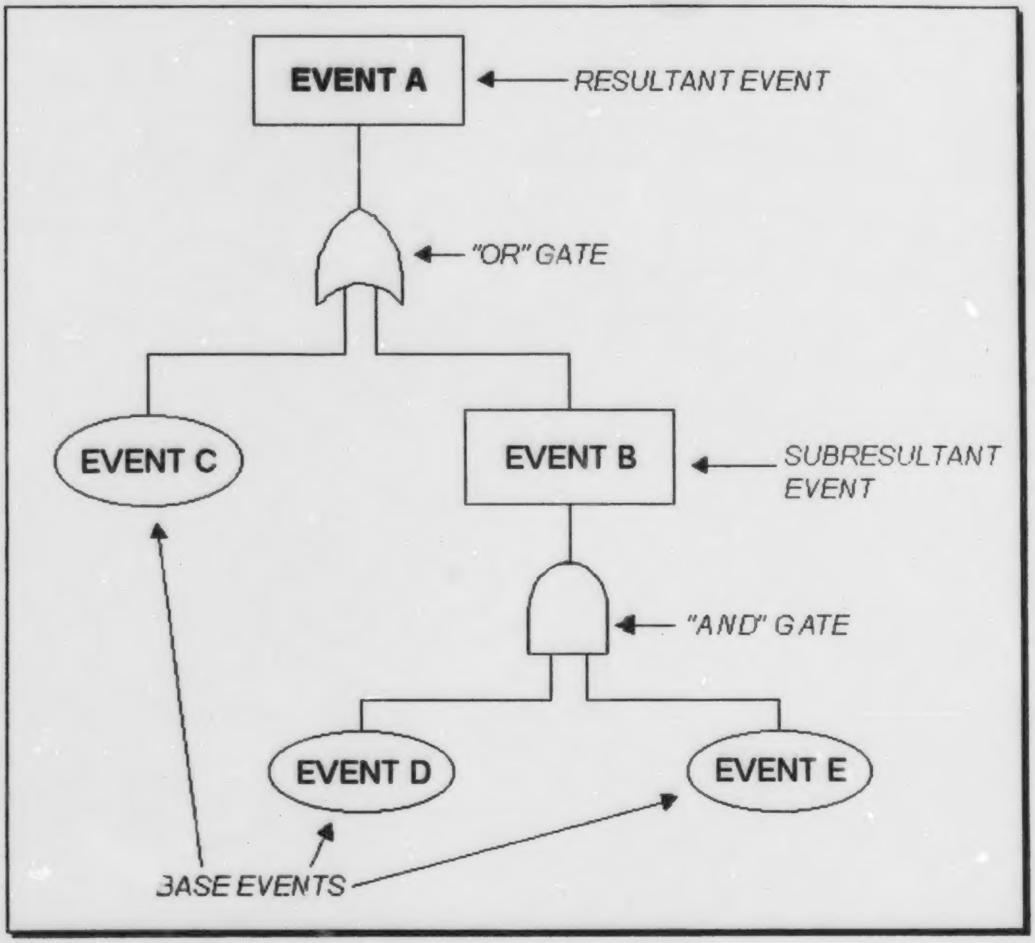

EVENT A
RESULTANT EVENT
"OR" GATE
EVENT C
EVENT B
SUBRESULTANT EVENT
"AND" GATE
EVENT D
EVENT E
BASE EVENTS

Figure 3.9 Basic fault tree structure

The probability calculations associated with OR and AND gates are illustrated in Figure 3.10. Simply stated, the probability of input events joined through an AND gate are multiplied to calculate the probability of the output event. The probability of input events joined through an OR gate are added to calculate the probability of the output event. The relevant equations and associated assumptions may be summarized as follows:

For AND Gate: $$P = \prod_{n}^{i=1} P_i \tag{3.1a}$$

Example: Output Event Probability = P_x
Input Events failure probabilities, P_1, P_2, ….

$$P_x = P_1(P_2)(P_3) \tag{3.1b}$$

For OR Gate: $$P = 1 - \prod_{n}^{i=1}(1 - P_i) \tag{3.2a}$$

Example: Output Event Probability = Py
Input Event failure probabilities, P_1, P_2, …

$$Py = 1 - \prod_{n}(1 - P_1)(1 - P_2)(1 - P_3)$$

$$Py = P_1 + P_2 + P_3; P_i \leq 0.1 \tag{3.2b}$$

Input data for reliability evaluations consist of the failure rates associated with base events. Unreliability ($\bar{R}$) is usually the parameter of concern and may be simply described as the product of the failure rate and time [1, 43]. The relevant reliability equations and associated assumptions may be summarized as follows:

Unreliability $$\overline{R} = 1 - Reliability\ (R) \tag{3.3a}$$

$$\overline{R}(t) = \lambda t; \lambda = constant,\ \lambda t \leq 0.1 \tag{3.3b}$$

Where λ = failure rate, t = time

Unreliability of base events given by Equations 3.3 may be combined using the previously described AND and OR gate computations to calculate the system downtime.

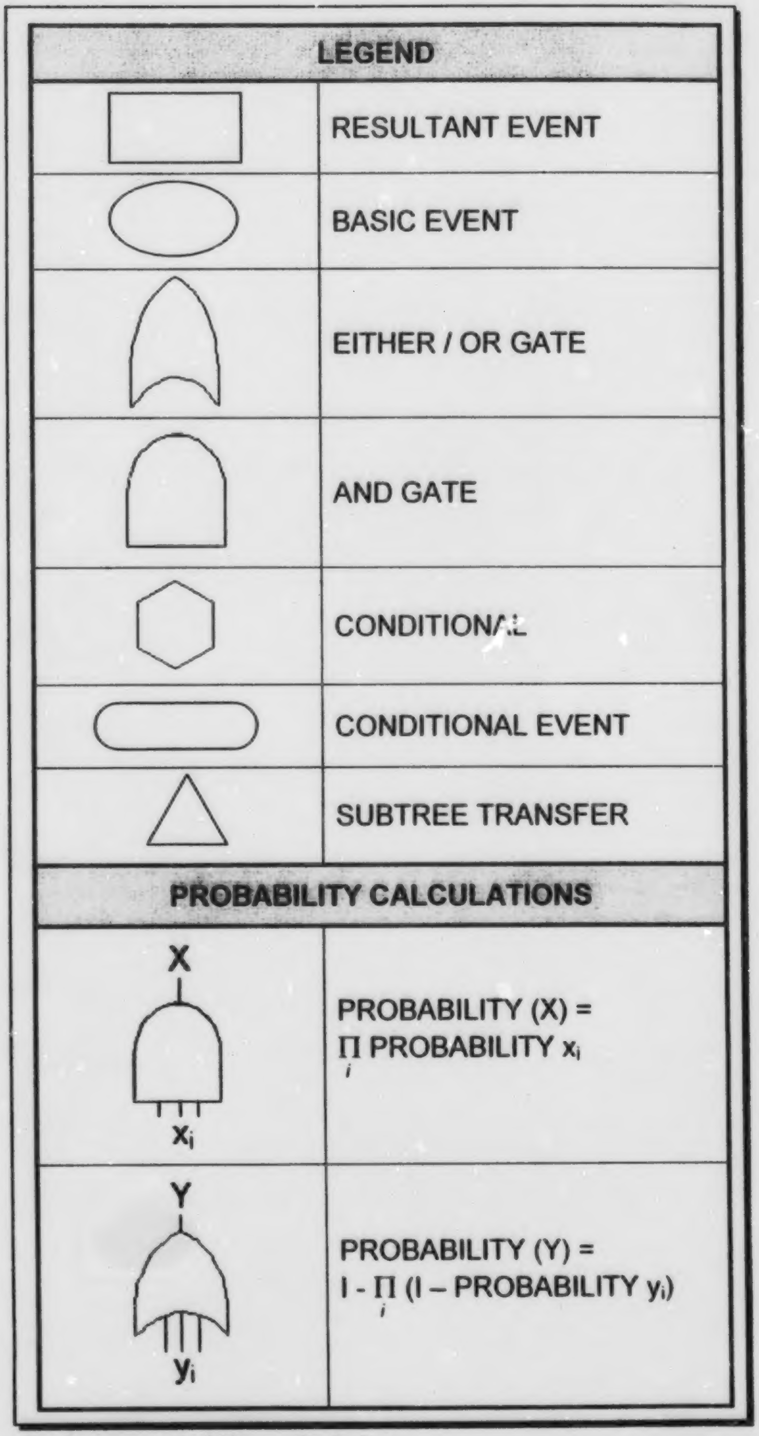

LEGEND
RESULTANT EVENT
BASIC EVENT
EITHER / OR GATE
AND GATE
CONDITIONAL
CONDITIONAL EVENT
SUBTREE TRANSFER
PROBABILITY CALCULATIONS
X
x_i
PROBABILITY (X) = $\prod_i$ PROBABILITY x_i
Y
y_i
PROBABILITY (Y) = I - $\prod_i$ (I – PROBABILITY y_i)

Figure 3.10 Fault tree probability calculations

3.2.4 General Approaches to Simulation

In mathematical simulation modelling [1, 15, 20, 43], each step in a process is depicted and integrated as a continuous set of steps to model the process. Generally, simulation is done on a time basis, although other simulation modes such as activity progress uncertainty analysis (independent of time) can be carried out. Simulation can be applied to both expected value analysis and probabilistic distribution analysis. In expected value analysis, simulation is relatively simple for time sequences involving the addition of appropriate arithmetic combinations of activity and subactivity times until the entire process has been completed.

Naturally, different outcomes of activity may need to be incorporated using fault trees adopted from the risk analysis methodologies described in subsection 3.2.3. In probabilistic simulation, however, the problem is somewhat more complex because some of the input variables are provided as distributions or other non-single valued functions. Although closed form or analytical methods are relatively simple for the application of normally distributed random variables [21], this it not the case for general distributions such as those applicable to human error factors [43] and mechanical component performance. For such cases, the simulation can be carried out using numerical methods for combining the probability distributions. There are two such principal methods: Markov chains and Monte Carlo methods. In the present application, Monte Carlo methods will be used.

Monte Carlo simulation

Monte Carlo modelling is a systematic methodology for representing the outcome of a set of interactions involving an intractable random character. It is generally used as a method of simulation over a period of time; accordingly, simulation may progress as a series of constrained random draws spaced a time increment apart and progressing in time. Thus, Monte Carlo techniques are used to evaluate mathematically intractable probabilistic relationships. As an example, if the independent inputs to a fault tree diagram are all given as general probabilistic distributions, then an efficient way to evaluate the resultant top event probability density is via a Monte Carlo technique. In this case a large number of sets of inputs are drawn from respective input probability distributions resulting in a distribution of the resultant event probability.

The basics of Monte Carlo modelling can be illustrated relatively easily. Consider a deterministic equation – force equals mass times acceleration – and assume we wish to know how the force variable will vary over a period of time for which we have a random distribution of accelerations. These accelerations, from our population base, can be represented as a cumulative distribution function (CDF) illustrated in Figure 3.11. The CDF gives the probability on the vertical axis that the corresponding value on the horizontal axis will not be exceeded. For example, there is a probability of 1.0 (100 percent) that the maximum value of x (x_{max}) will not be exceeded. Figuratively, all the values of the acceleration variable are put into a hat, mixed up, and drawn out in random fashion. The force is then calculated based on each draw and from that, a probability distribution of the force outcome is constructed. For this simple case, the force distribution will be the acceleration distribution times a constant. Mathematically, the draw is performed by generating a set of normalized random numbers for the ordinate of the cumulative distribution of the function from which these draws are successively being made.

As illustrated in Figure 3.11, the CDF is also a measure of the accuracy of information or, conversely, the randomness of the distribution. As can be seen from this figure, if the distribution is a vertical line, no matter where one draws on the vertical axis, the same value of the variable will result – that is, the variable is a constant. At the other extreme, if the variable is completely random then the distribution will be represented as a diagonal straight line between the minimum and maximum value. Intermediate qualitative descriptions of the randomness of the variable follow from inspection of the CDF in Figure 3.11.

Two important concepts related to the CDF enter into Monte Carlo modelling: auto-correlation and cross-correlation. Suppose the accelerations can vary only within a specified interval over the simulation time increment. Then, after the first random draw, the next draw would be restricted within certain limits of the initial draw simply as a result of the physical restrictions of the problem. Such a restriction is represented as an auto-correlation coefficient. Now, suppose that not only are the accelerations varying, but also the masses. Suppose further, however, that given a certain acceleration, a restriction were placed on the range of masses associated with that acceleration. Say, only small masses could associate with the full range of acceleration, while large masses could only be associated with certain lower accelerations. Then, such a relationship would be expressed as a cross-correlation factor and certain limits would be imposed for the drawing on both accelerations and associated masses.

Monte Carlo simulation of risk is optimal and effective whenever a comprehensive risk evaluation is required and adequate input is available, or where large uncertainties in input data exist, and trends are being assessed (as is the case here).

3.3 RPT Architecture and Software Basis

3.3.1 RPT Architecture and Software Basis

RPT architecture

The architecture of the RPT is depicted in Figure 3.12. In addition to showing the architectural structure, the main issue for each of the RPT modes and functions is given directly below the corresponding item.

The flow of data through the software architecture is schematically depicted in Figure 3.13. As can be seen, the global inputs interact with global parameters, which in turn feed into each of the principal component analyses: the escape, the evacuation, and the rescue module. In each case, the sequence is the same, with initiating inputs, parameter transformations, execution of the analysis, and generation of outputs. Each of the three modules feeds simultaneously into the integrated EER analysis, which is used to generate the integrated EER output. For detailed descriptions of each module, reference is made to [7, 8]. For results, please refer to Chapter 5 herein.

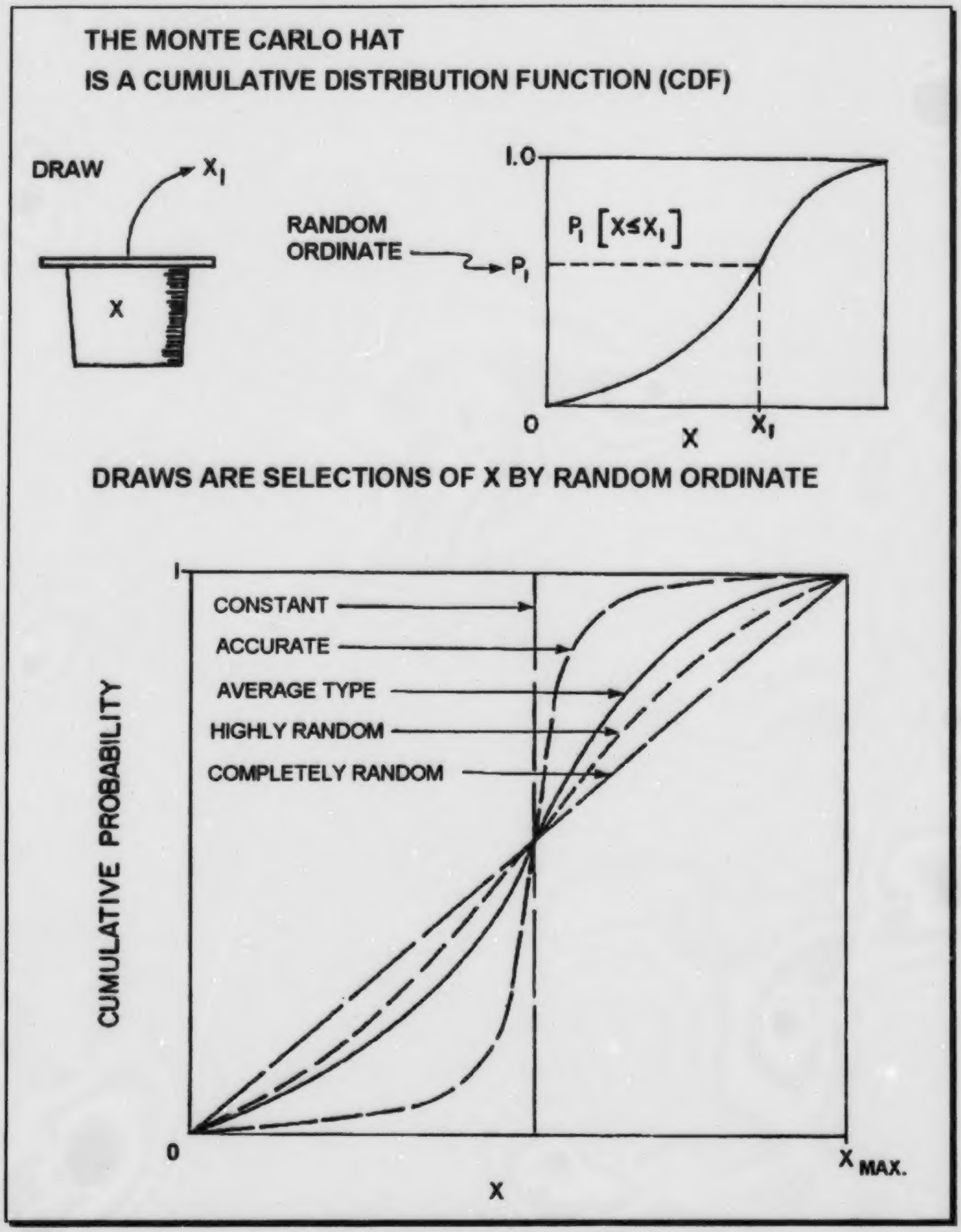

THE MONTE CARLO HAT
IS A CUMULATIVE DISTRIBUTION FUNCTION (CDF)
DRAW
X_1
X
RANDOM ORDINATE
P_1
1.0
$P_1 [X \leq X_1]$
0
X
X_1
DRAWS ARE SELECTIONS OF X BY RANDOM ORDINATE
1
CONSTANT
ACCURATE
AVERAGE TYPE
HIGHLY RANDOM
COMPLETELY RANDOM
CUMULATIVE PROBABILITY
0
X
X MAX.

Figure 3.11 Monte Carlo technique schematic

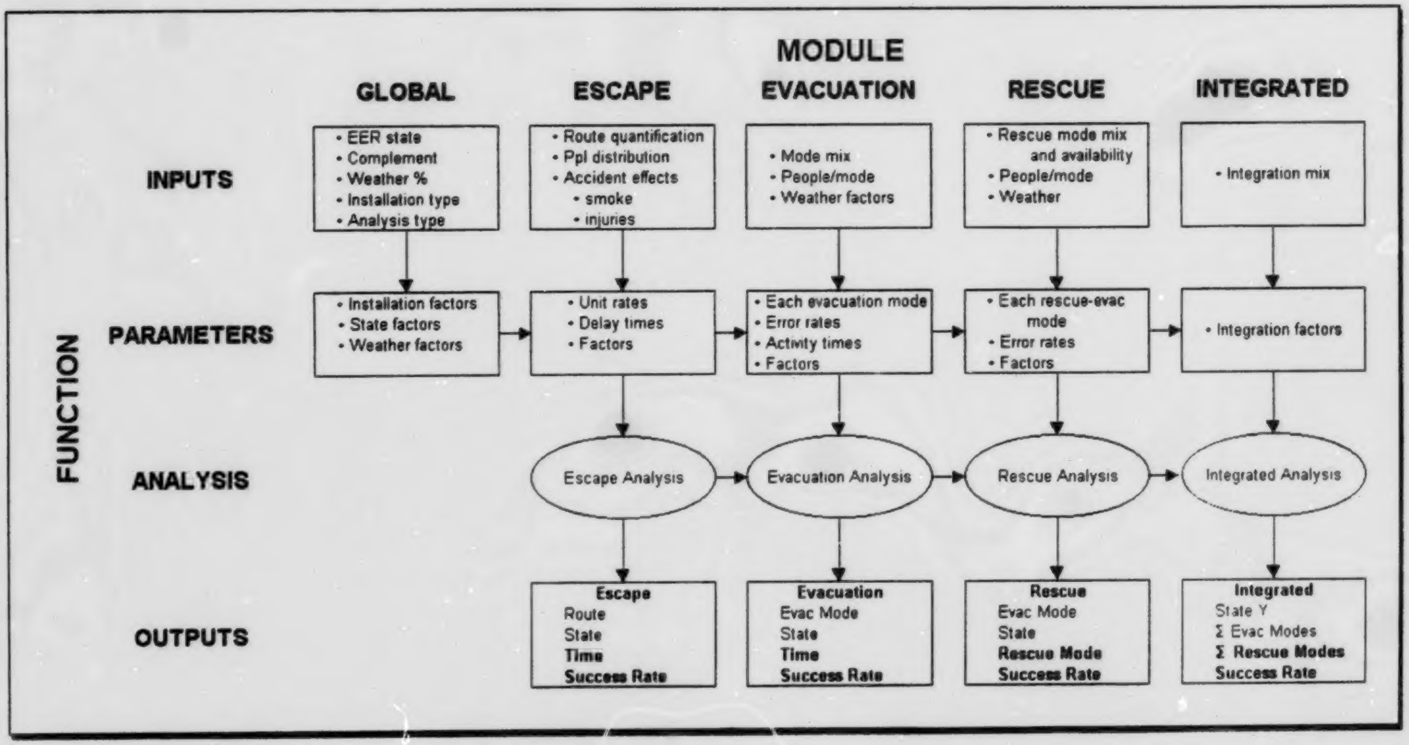

MODULE
GLOBAL
ESCAPE
EVACUATION
RESCUE
INTEGRATED
FUNCTION
INPUTS
PARAMETERS
ANALYSIS
OUTPUTS
• EER state
• Complement
• Weather %
• Installation type
• Analysis type
• Route quantification
• Ppl distribution
• Accident effects
• smoke
• injuries
• Mode mix
• People/mode
• Weather factors
• Rescue mode mix and availability
• People/mode
• Weather
• Integration mix
• Installation factors
• State factors
• Weather factors
• Unit rates
• Delay times
• Factors
• Each evacuation mode
• Error rates
• Activity times
• Factors
• Each rescue-evac mode
• Error rates
• Factors
• Integration factors
Escape Analysis
Evacuation Analysis
Rescue Analysis
Integrated Analysis
Escape
Route
State
Time
Success Rate
Evacuation
Evac Mode
State
Time
Success Rate
Rescue
Evac Mode
State
Rescue Mode
Success Rate
Integrated
State Y
Σ Evac Modes
Σ Rescue Modes
Success Rate

Figure 3.12 Expected value RPT architecture and screen references

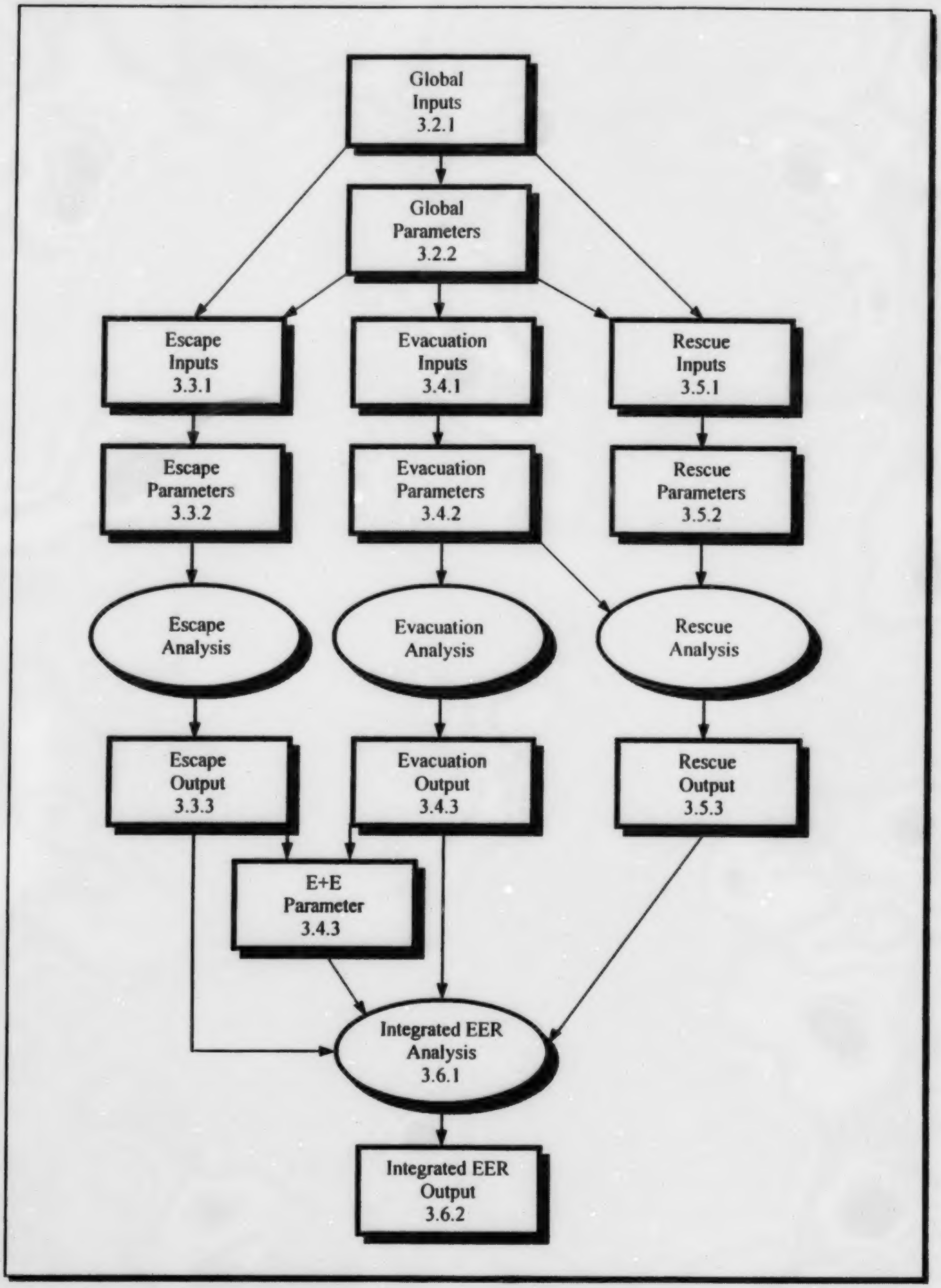

Global
Inputs
3.2.1
Global
Parameters
3.2.2
Escape
Inputs
3.3.1
Evacuation
Inputs
3.4.1
Rescue
Inputs
3.5.1
Escape
Parameters
3.3.2
Evacuation
Parameters
3.4.2
Rescue
Parameters
3.5.2
Escape
Analysis
Evacuation
Analysis
Rescue
Analysis
Escape
Output
3.3.3
Evacuation
Output
3.4.3
Rescue
Output
3.5.3
E+E
Parameter
3.4.3
Integrated EER
Analysis
3.6.1
Integrated EER
Output
3.6.2

Figure 3.13 RPT data flow diagram

Expected value RPT software basis

The expected value RPT is programmed in Microsoft Excel 7 and Visual Basic. The current version 3.3 consists of a single file.

It should be noted that the RPT is a partially interactive program to be used by personnel familiar with the EER modelling process described earlier, as well as with the use of RPT, which can be gained from use of version 3.3 and careful study of the online help. It is not an interactive game or a user-friendly program that can be used by people unfamiliar with the basics of EER. Such a user-friendly RPT version would necessarily have to over-simplify many of the relatively complex human/technology/environment interactions that the RPT is capable of modelling, resulting in trivial and potentially misleading outputs.

Monte Carlo (MC) RPT Software Basis

General description of MC RPT software basis

The MC RPT is programmed in Microsoft Excel 7, together with the @RISK simulation add-in module. Three licences of the @RISK module were provided in March 2000 to the Transportation Development Centre (TDC). @RISK extends the analytical capabilities of the Microsoft Excel for Windows spreadsheet to include risk analysis and simulation. These techniques allow one to analyse spreadsheets for risk using simulation. Simulation identifies the range of possible outcomes one can expect for a spreadsheet result and their relative likelihood of occurrence.

The @ RISK toolbars

To add risk analysis capabilities to spreadsheets, @RISK [48] uses both a toolbar in the spreadsheet and an expanded application window. The expanded window has a larger version of the toolbar (Figure 3.14) from the spreadsheet.

The toolbar is used to make selections from spreadsheets in "add-in" style. In @RISK for Excel, the DecisionTools toolbar is used to access the other programs in the DecisionTools suite. The larger application window displays @RISK results and graphs. All @RISK results and graphs can be placed directly in the spreadsheet for reporting purposes.

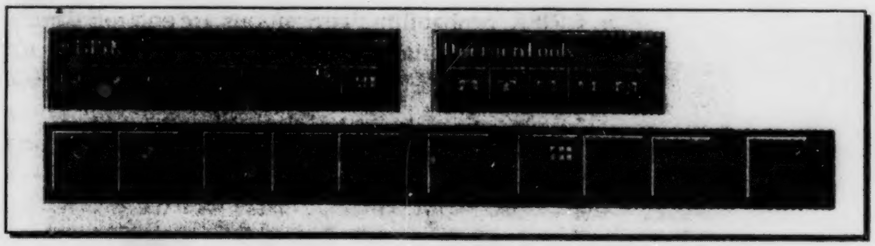


Figure 3.14 @RISK toolbar

Using the online tutorial

The material summarized in this section is presented on line in the short lesson started by clicking the icon entitled *The @RISK Tutorial* in the @RISK program group. The time required to complete this online lesson is less than ten minutes. Also, the tutorial can be run directly from the @RISK CD by selecting "Tutorials" and then "@RISK" from the main menu.

Simulation inputs

@RISK uses the technique of Monte Carlo simulation. With this technique, uncertain input values in the spreadsheet are specified as probability distributions. An input value is a value in a spreadsheet cell or formula that is used to generate results in the spreadsheet. In @RISK, a probability distribution that describes the range of possible values for the input is substituted for its original single fixed value.

Distribution functions

In @RISK, probability distributions are entered directly into the worksheet formulas using custom distribution functions. These new functions, each of which represents a type of probability distribution (such as NORMAL or BETA), are added to the spreadsheet's function set by @RISK. When entering a distribution function one can enter both the function name, such as **RiskTriang** – a triangular distribution – and the arguments which describe the shape and range of the distribution, such as (10,20,30), where 10 is the minimum value, 20 the most likely value, and 30 the maximum value. Figure 3.15 shows a triangular distribution as used here.

Distribution functions may be used any time there is uncertainty about the value that is used. @RISK's functions may be used just as one would use any normal spreadsheet functions – include them in mathematical expressions and have cell references or formulas as arguments. Thus, MC RPT has predesignated distributions that can be identified in the Input or Parameter screens.

Simulation outputs and running a simulation

Once distribution functions have been entered into the spreadsheet, the cells (or ranges of cells) for which simulation results are required need to be identified. Typically, these output cells contain the results of the spreadsheet model (such as "success") but they can be any cells, anywhere in the spreadsheet. To select outputs, simply highlight the cell or range of cells needed as outputs in the worksheet and then click the Add Output icon – the one with the red down arrow.

When a simulation is run, the spreadsheet is calculated over and over again – a process called "iterations" – with a set of new possible values sampled from each input distribution in each iteration, as described in subection 3.2.4. In each iteration the spreadsheet is recalculated with a new set of sampled values and a new possible result is generated for the output cells.

TRIGEN (bottom, most likely, top, bottom%, top%)

Applications for the trigen function include rough modelling in the absence of data, used where minimum and maximum specified values for a triangular distribution can occur.

The TRIGEN distribution is not available in BestFit.

Density:
no closed form

Distribution:
no closed form

Parameters:
bottom#most likely#top, bottom<top, 0#bottom%<top%#100

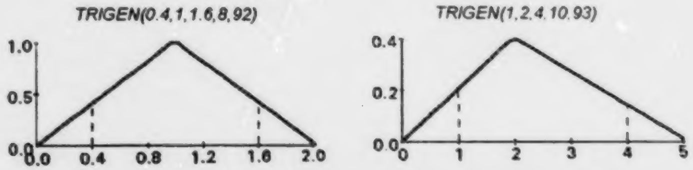
Domain:
no closed form

Mean:
no closed form

Mode:
most likely

Variance:
no closed form

Trigen Graphs:



TRIGEN(0.4,1,1.6,8,92)

TRIGEN(1,2.4.10.93)

Figure 3.15 Triangular distribution as used here

As a simulation progresses, new possible outcomes are generated at each iteration. @RISK keeps track of these output values. A distribution of possible outcomes is created by taking all the possible output values generated, analysing them, and calculating statistics on how they are distributed across their minimum-maximum range.

Simulation results

@RISK simulation results include distributions (e.g., Figure 5.6) of possible results for selected outputs. In addition, @RISK generates sensitivity and scenario analysis reports that identify the input distributions most critical to the results. These results are best presented graphically.

Available graphs include frequency distributions of possible output variable values, cumulative probability curves, and summary graphs that summarize changing risk across a range of output cells. @RISK graphs and reports can be copied directly to the Excel worksheet. Using the editing tools in the spreadsheet, these graphs and reports can be further enhanced and annotated for presentation purposes. An example of a graph and report generated by an @RISK simulation is shown in Figure 3.16; the worksheet format is typified later (e.g., Figure 5.6).

3.3.2 RPT V3.3 Functional Development

Screen interactions and design

The version 3.3 RPT and the MC RPT are fully functional as illustrated in Chapter 5.

The first screen of the current RPT version is an index screen with a variety of tabs, each leading to the appropriate module screen. This index screen is shown in Figure 3.17. If the user wishes to proceed to global parameters, for example, this can be accomplished by clicking on "global parameters" to get the global parameter screen as shown in Figure 3.18. The parameters are embedded in the model and password protected so the user would only display this screen for information. As can be seen, an index and help button again appear near the top of the screen. To return to the main index screen, click on "index". To display the help screen, as described below, click on "help".

This centralized screen integration to the main index screen, with individual help files for each of the individual screens, is designed to facilitate use of the RPT.

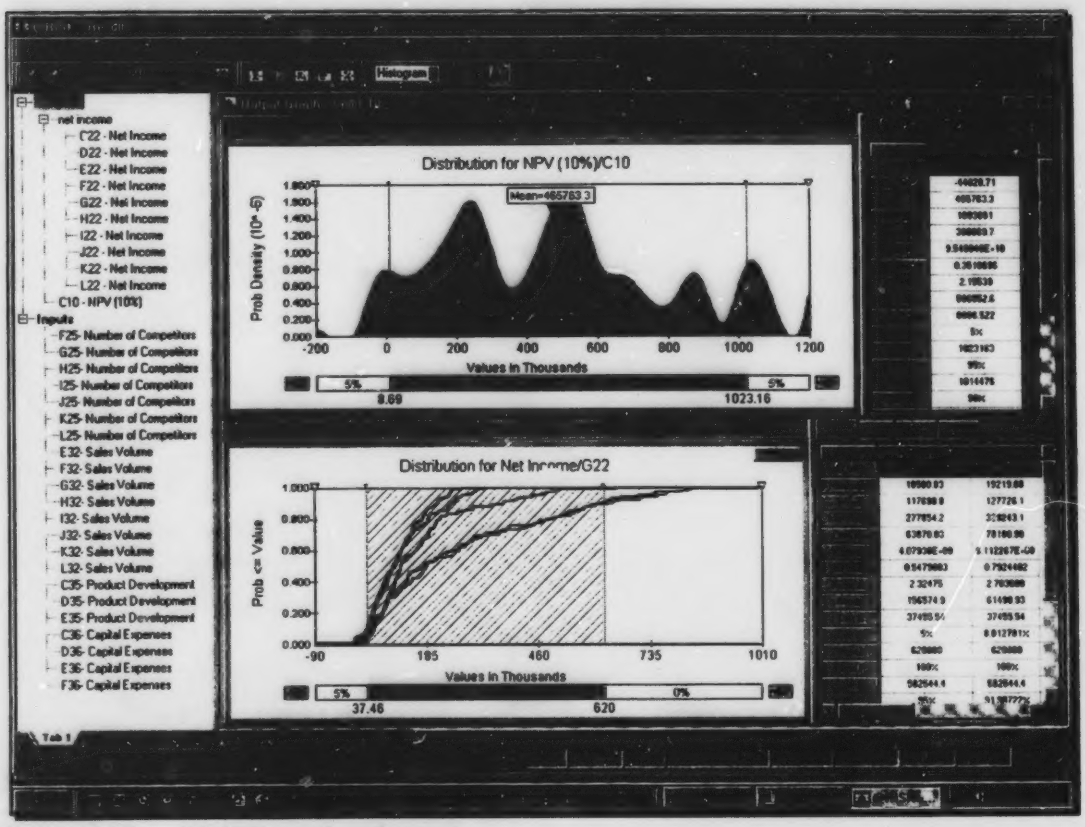

Histogram
net income
C22 - Net Income
D22 - Net Income
E22 - Net Income
F22 - Net Income
G22 - Net Income
H22 - Net Income
I22 - Net Income
J22 - Net Income
K22 - Net Income
L22 - Net Income
C10 - NPV (10%)
Inputs
F25- Number of Competitors
G25- Number of Competitors
H25- Number of Competitors
I25- Number of Competitors
J25- Number of Competitors
K25- Number of Competitors
L25- Number of Competitors
E32- Sales Volume
F32- Sales Volume
G32- Sales Volume
H32- Sales Volume
I32- Sales Volume
J32- Sales Volume
K32- Sales Volume
L32- Sales Volume
C35- Product Development
D35- Product Development
E35- Product Development
C36- Capital Expenses
D36- Capital Expenses
E36- Capital Expenses
F36- Capital Expenses
Tab 1
Distribution for NPV (10%)/C10
Mean=465763.3
Prob Density (10^-6)
1.800
1.600
1.400
1.200
1.000
0.800
0.600
0.400
0.200
0.000
-200
0
200
400
600
800
1000
1200
Values in Thousands
5%
5%
8.69
1023.16
Distribution for Net Income/G22
Prob <= Value
1.000
0.800
0.600
0.400
0.200
0.000
-90
185
460
735
1010
Values in Thousands
5%
0%
37.46
620

Figure 3.16 @RISK graph and report

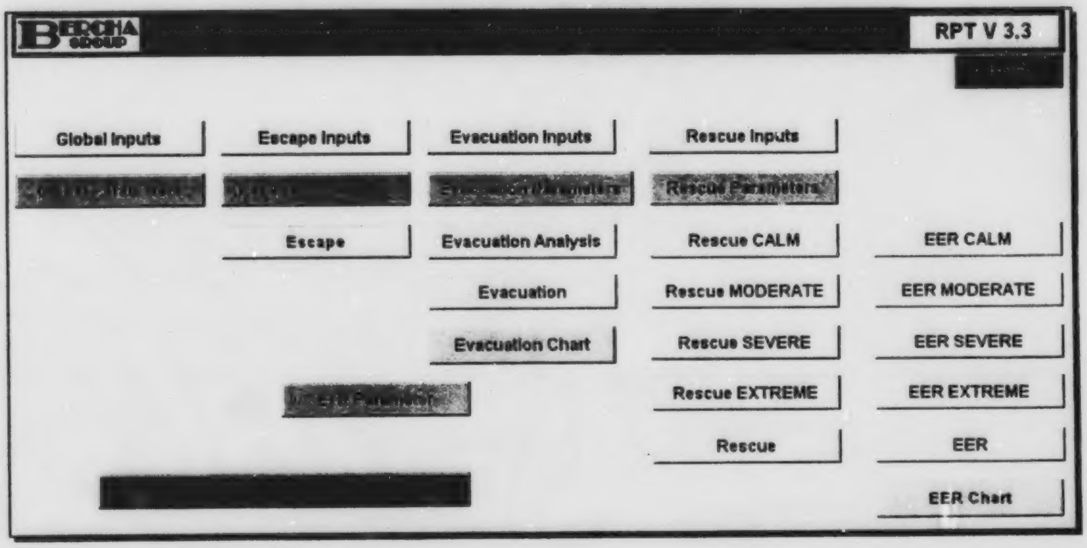
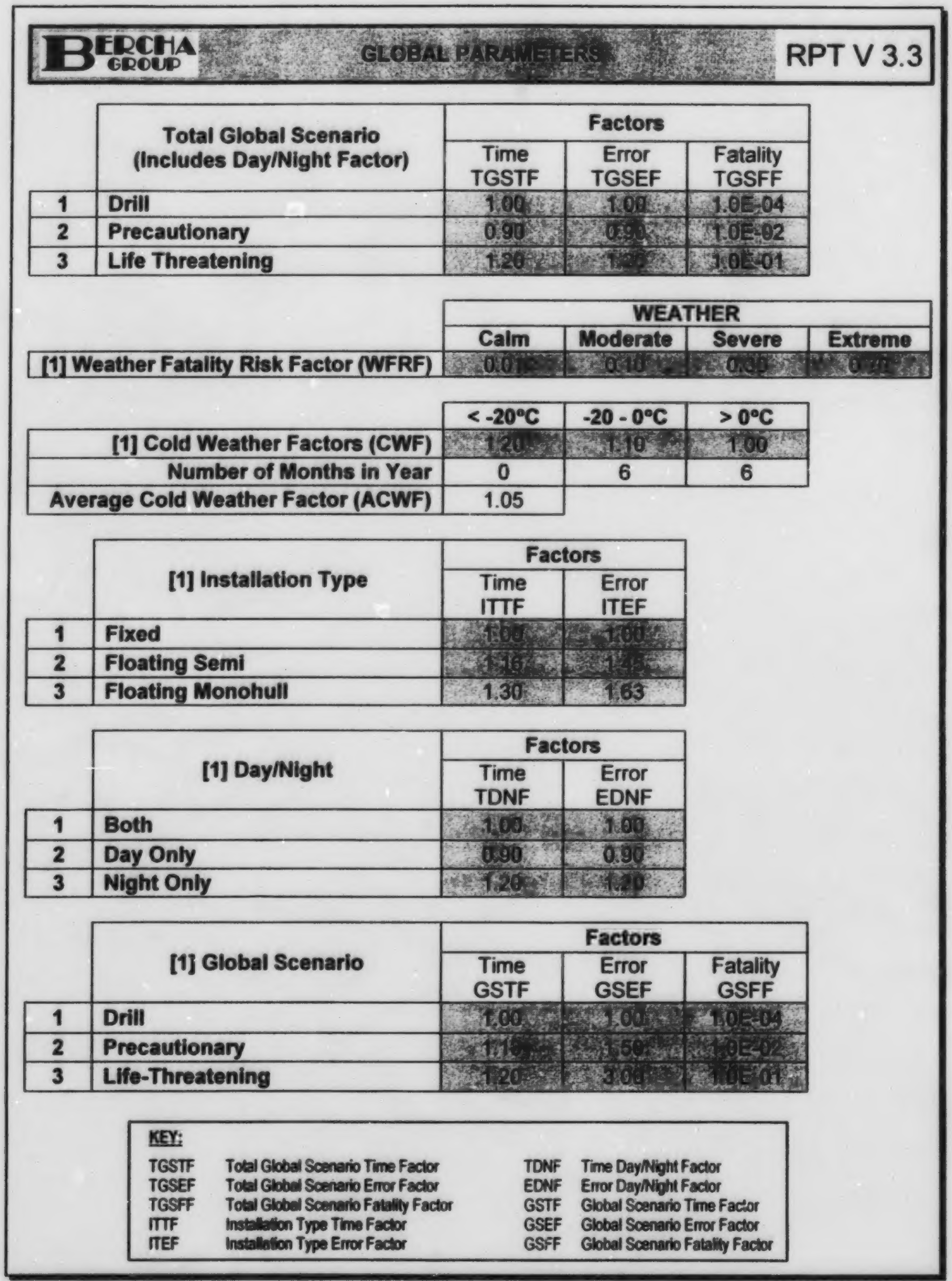

BERCHA GROUP
RPT V 3.3
Global Inputs
Escape Inputs
Evacuation Inputs
Rescue Inputs
Rescue Parameters
Escape
Evacuation Analysis
Rescue CALM
EER CALM
Evacuation
Rescue MODERATE
EER MODERATE
Evacuation Chart
Rescue SEVERE
EER SEVERE
Rescue EXTREME
EER EXTREME
Rescue
EER
EER Chart

Figure 3.17 RPT index screen



	Total Global Scenario (Includes Day/Night Factor)	Factors		
		Time TGSTF	Error TGSEF	Fatality TGSFF
1	Drill	1.00	1.00	1.0E-04
2	Precautionary	0.90	0.90	1.0E-02
3	Life Threatening	1.20	1.20	1.0E-01

	WEATHER			
	Calm	Moderate	Severe	Extreme
[1] Weather Fatality Risk Factor (WFRF)	0.01	0.10	0.30	[illegible]

	< -20°C	-20 - 0°C	> 0°C
[1] Cold Weather Factors (CWF)	1.20	1.10	1.00
Number of Months in Year	0	6	6
Average Cold Weather Factor (ACWF)	1.05		

	[1] Installation Type	Factors	
		Time ITTF	Error ITEF
1	Fixed	1.00	1.00
2	Floating Semi	1.16	1.45
3	Floating Monohull	1.30	1.63

	[1] Day/Night	Factors	
		Time TDNF	Error EDNF
1	Both	1.00	1.00
2	Day Only	0.90	0.90
3	Night Only	1.20	1.20

	[1] Global Scenario	Factors		
		Time GSTF	Error GSEF	Fatality GSFF
1	Drill	1.00	1.00	1.0E-04
2	Precautionary	1.10	1.50	1.0E-02
3	Life-Threatening	1.20	3.00	1.0E-01

KEY:

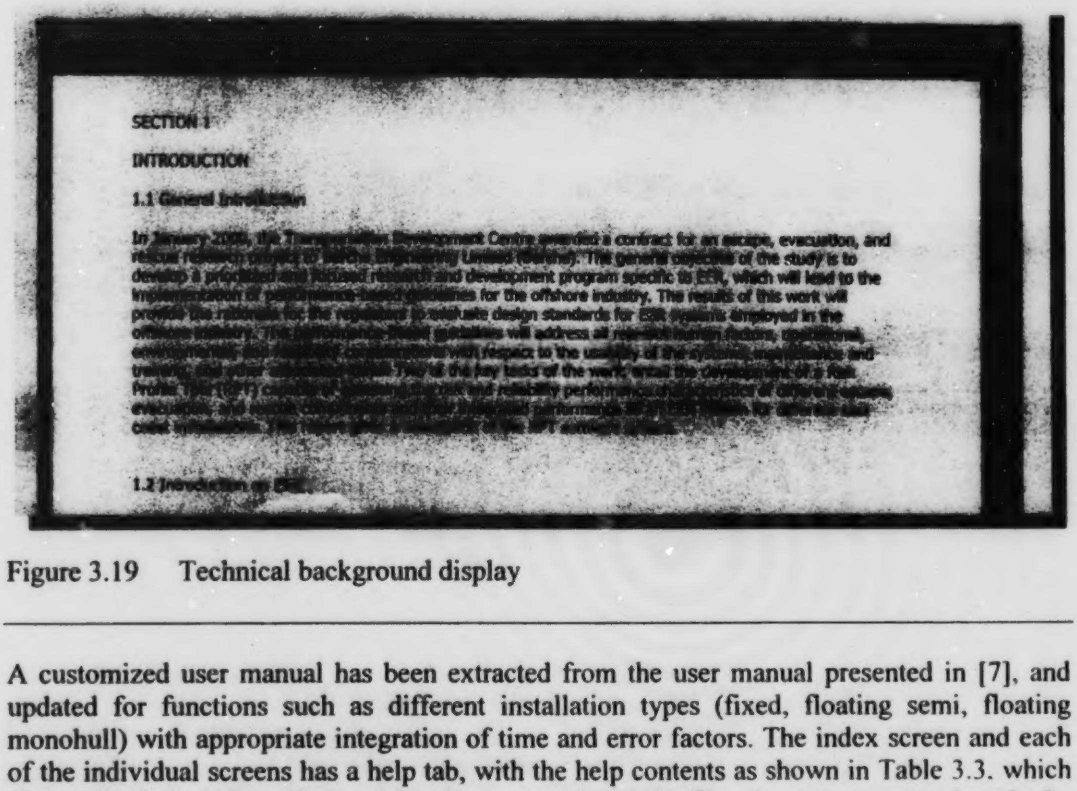
TGSTF	Total Global Scenario Time Factor	TDNF	Time Day/Night Factor
TGSEF	Total Global Scenario Error Factor	EDNF	Error Day/Night Factor
TGSFF	Total Global Scenario Fatality Factor	GSTF	Global Scenario Time Factor
ITTF	Installation Type Time Factor	GSEF	Global Scenario Error Factor
ITEF	Installation Type Error Factor	GSFF	Global Scenario Fatality Factor

Figure 3.18 Global parameters screen

Online help and documentation

Both online help and full technical documentation have been included in the RPT software system itself. The technical background essentially gives the contents of the technical descriptions given in [7, 8]. Technical background can be accessed by clicking on the Technical Background icon on the index screen. Figure 3.19 shows the first page of the technical background online information screen, also showing the four alternative tabs to which the user can go. These are:

- Introduction
- RPT Methodology
- Expected Value RPT
- References



SECTION 1

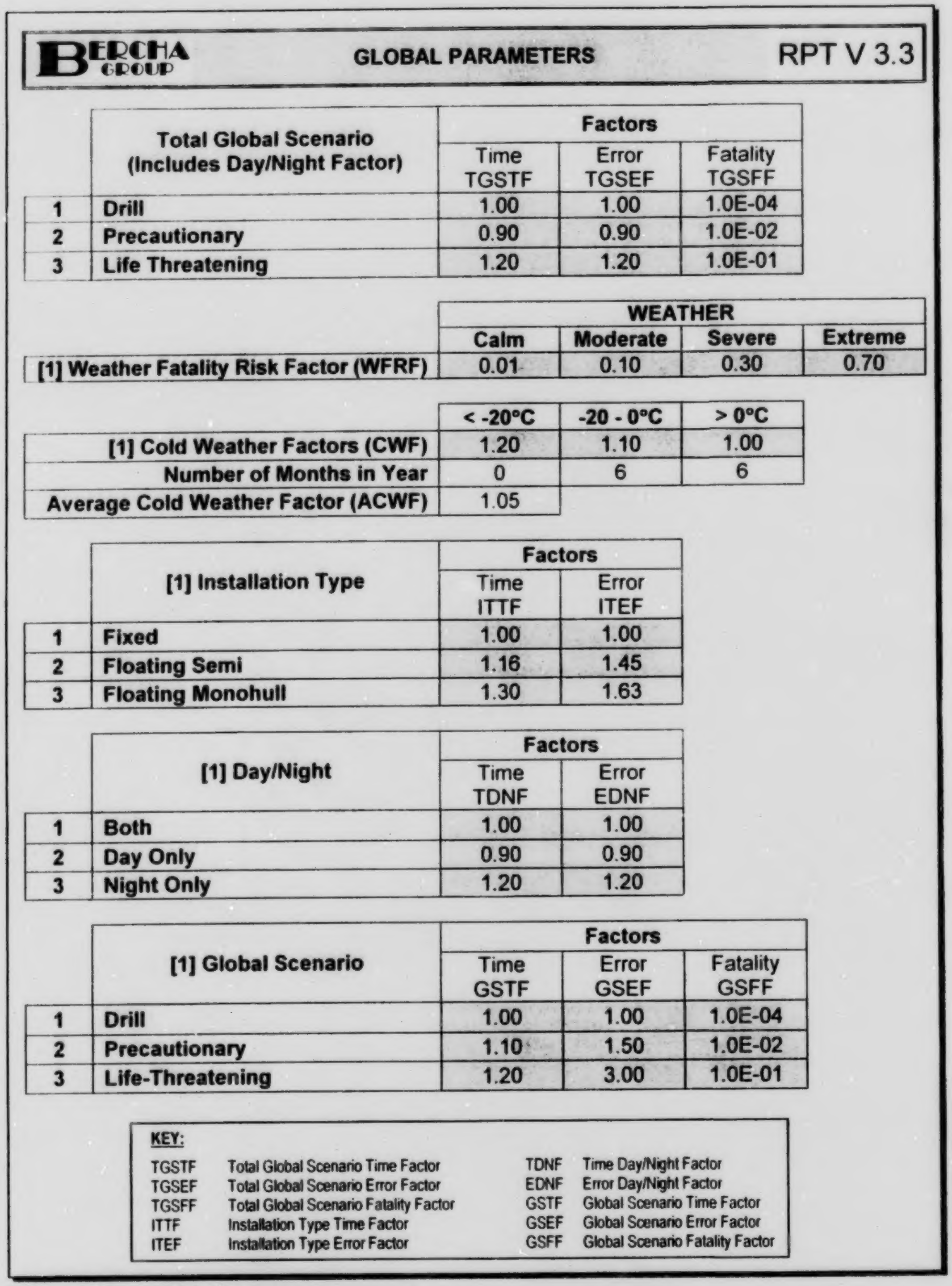
INTRODUCTION

1.1 General Introduction

1.2 Introduction on EER

Figure 3.19 Technical background display

A customized user manual has been extracted from the user manual presented in [7], and updated for functions such as different installation types (fixed, floating semi, floating monohull) with appropriate integration of time and error factors. The index screen and each of the individual screens has a help tab, with the help contents as shown in Table 3.3. which shows the help index. Figure 3.20 shows a typical help file, the one associated with the Global Parameter screen shown in Figure 3.18. The range of functions and results is described in the detailed reports [7, 8], while a typical application, including salient results, is covered in Chapter 5.



BERCHA GROUP

GLOBAL PARAMETERS

RPT V 3.3

	Total Global Scenario (Includes Day/Night Factor)	Factors		
		Time TGSTF	Error TGSEF	Fatality TGSFF
1	Drill	1.00	1.00	1.0E-04
2	Precautionary	0.90	0.90	1.0E-02
3	Life Threatening	1.20	1.20	1.0E-01

	WEATHER			
	Calm	Moderate	Severe	Extreme
[1] Weather Fatality Risk Factor (WFRF)	0.01	0.10	0.30	0.70

	< -20°C	-20 - 0°C	> 0°C
[1] Cold Weather Factors (CWF)	1.20	1.10	1.00
Number of Months in Year	0	6	6
Average Cold Weather Factor (ACWF)	1.05		

	[1] Installation Type	Factors	
		Time ITTF	Error ITEF
1	Fixed	1.00	1.00
2	Floating Semi	1.16	1.45
3	Floating Monohull	1.30	1.63

	[1] Day/Night	Factors	
		Time TDNF	Error EDNF
1	Both	1.00	1.00
2	Day Only	0.90	0.90
3	Night Only	1.20	1.20

	[1] Global Scenario	Factors		
		Time GSTF	Error GSEF	Fatality GSFF
1	Drill	1.00	1.00	1.0E-04
2	Precautionary	1.10	1.50	1.0E-02
3	Life-Threatening	1.20	3.00	1.0E-01

KEY:

TGSTF	Total Global Scenario Time Factor	TDNF	Time Day/Night Factor
TGSEF	Total Global Scenario Error Factor	EDNF	Error Day/Night Factor
TGSFF	Total Global Scenario Fatality Factor	GSTF	Global Scenario Time Factor
ITTF	Installation Type Time Factor	GSEF	Global Scenario Error Factor
ITEF	Installation Type Error Factor	GSFF	Global Scenario Fatality Factor

Figure 3.18 Global parameters screen

Online help and documentation

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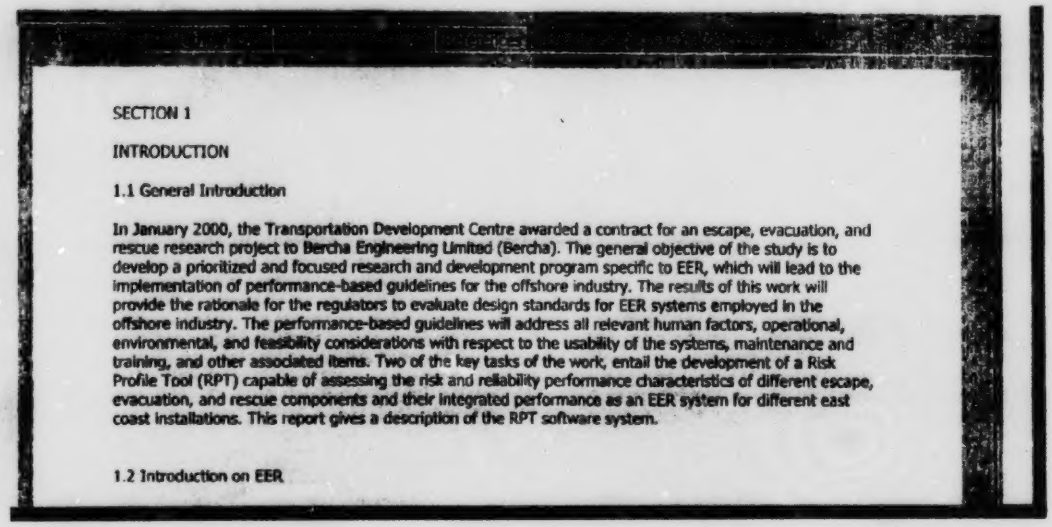
- References



SECTION 1

INTRODUCTION

1.1 General Introduction

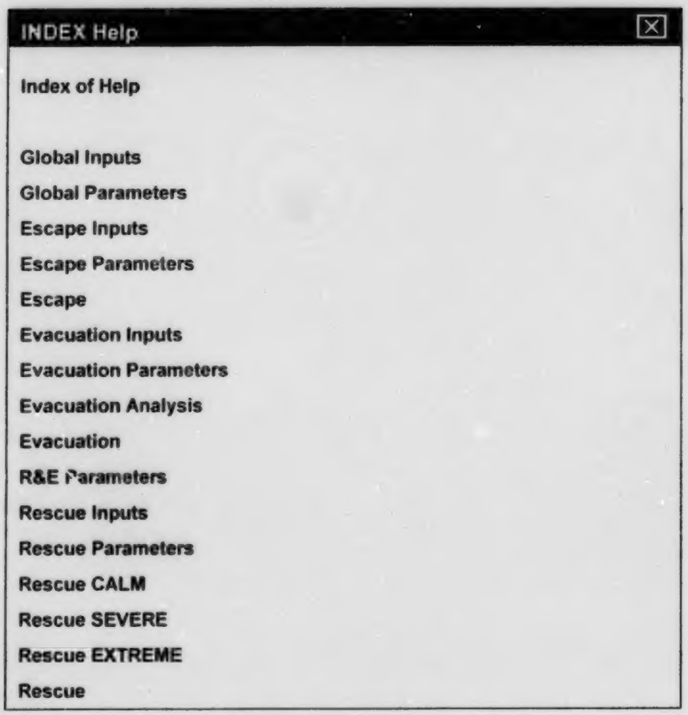
In January 2000, the Transportation Development Centre awarded a contract for an escape, evacuation, and rescue research project to Bercha Engineering Limited (Bercha). The general objective of the study is to develop a prioritized and focused research and development program specific to EER, which will lead to the implementation of performance-based guidelines for the offshore industry. The results of this work will provide the rationale for the regulators to evaluate design standards for EER systems employed in the offshore industry. The performance-based guidelines will address all relevant human factors, operational, environmental, and feasibility considerations with respect to the usability of the systems, maintenance and training, and other associated items. Two of the key tasks of the work, entail the development of a Risk Profile Tool (RPT) capable of assessing the risk and reliability performance characteristics of different escape, evacuation, and rescue components and their integrated performance as an EER system for different east coast installations. This report gives a description of the RPT software system.

1.2 Introduction on EER

Figure 3.19 Technical background display

A customized user manual has been extracted from the user manual presented in [7], and updated for functions such as different installation types (fixed, floating semi, floating monohull) with appropriate integration of time and error factors. The index screen and each of the individual screens has a help tab, with the help contents as shown in Table 3.3, which shows the help index. Figure 3.20 shows a typical help file, the one associated with the Global Parameter screen shown in Figure 3.18. The range of functions and results is described in the detailed reports [7, 8], while a typical application, including salient results, is covered in Chapter 5.

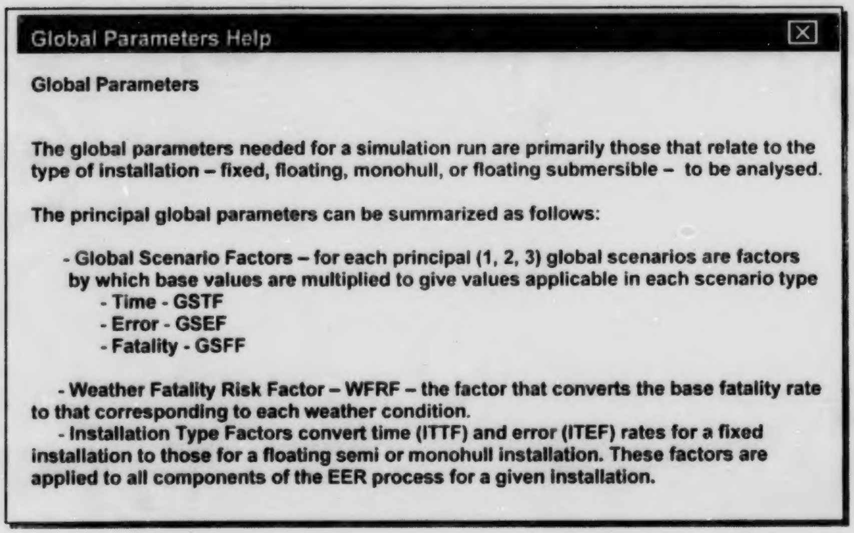
Table 3.3 Help topics index



INDEX Help

Index of Help

- Global Inputs
- Global Parameters
- Escape Inputs
- Escape Parameters
- Escape
- Evacuation Inputs
- Evacuation Parameters
- Evacuation Analysis
- Evacuation
- R&E Parameters
- Rescue Inputs
- Rescue Parameters
- Rescue CALM
- Rescue SEVERE
- Rescue EXTREME
- Rescue



Global Parameters Help

Global Parameters

The global parameters needed for a simulation run are primarily those that relate to the type of installation – fixed, floating, monohull, or floating submersible – to be analysed.

The principal global parameters can be summarized as follows:

- Global Scenario Factors – for each principal (1, 2, 3) global scenarios are factors by which base values are multiplied to give values applicable in each scenario type
  - Time - GSTF
  - Error - GSEF
  - Fatality - GSFF

- Weather Fatality Risk Factor – WFRF – the factor that converts the base fatality rate to that corresponding to each weather condition.
- Installation Type Factors convert time (ITTF) and error (ITEF) rates for a fixed installation to those for a floating semi or monohull installation. These factors are applied to all components of the EER process for a given installation.

Figure 3.20 Global Parameters Help screen

3.4 Model Validation

3.4.1 General Approaches to Parameter and Model Validation

Parameter and model validation was approached through a number of paths as follows:

- Data from full-scale EER components, primarily in drills from SOEP, Secunda, and Pan-Canadian.
- Full-scale monitored experiments for selected EER parameters (see Chapter 4).
- Expert opinion for extrapolation of dataless parameters and conditions.

Two levels of model validation are presented in this section, as follows:

- Parameter validation
- RPT result validation

As indicated in subsection 3.2.2, parameters are the primary building blocks of the RPT. They represent the quantitative components of the unit-risk and simulation-time inputs to the analysis. Because parameters often cover a range of conditions or set of sub-activities, validation through comparison to data, expert opinion, or direct analysis is required.

On the model and module scale, validation for full-scale activities can also be carried out; it is, however, restricted to the time simulation results as appropriate statistical failure data for individual EER scenarios are available only in anecdotal form rather than documented quantitative form. Nevertheless, runs of the RPT can be made for selected full-scale data sets of components of the EER process obtained from operators and industry. These validation run results are discussed in subsection 3.4.3.

3.4.2 Parameter Validation

The number of parameters needed was significantly reduced through the utilization of base error factors, base time factors, and other modelling algorithms that simplify the relatively complex situation being modelled.

Generally, parameter validation was approached through the establishment of base case parameters – those associated with a drill situation – largely on the basis of available data and the quantification of factors to extrapolate these parameters to dataless conditions, including life-threatening situations as well as severe and extreme weather effects. A discussion of the parameters required within the context of the model follows.

Global parameters

Figure 3.21 shows the global parameters, all in the form of factors, that are needed for model validation and utilization. As can be seen, there are six sets of factors required:

- Total Global Scenario
  - Time Factor (TGSTF)
  - Error Factor (TGSEF)
  - Fatality Factor (TGSFF)
- Weather Fatality Risk Factor (WFRF)
- Cold Weather Factors (CWF, ACWF)
- Installation Type Factors
  - Time Factor (ITTF)
  - Error Factor (ITEF)
- Day/Night Factors
  - Time (TDNF)
  - Error (EDNF)
- Global Scenario Factors
  - Time (GSTF)
  - Error (GSEF)
  - Fatality (GSFF)

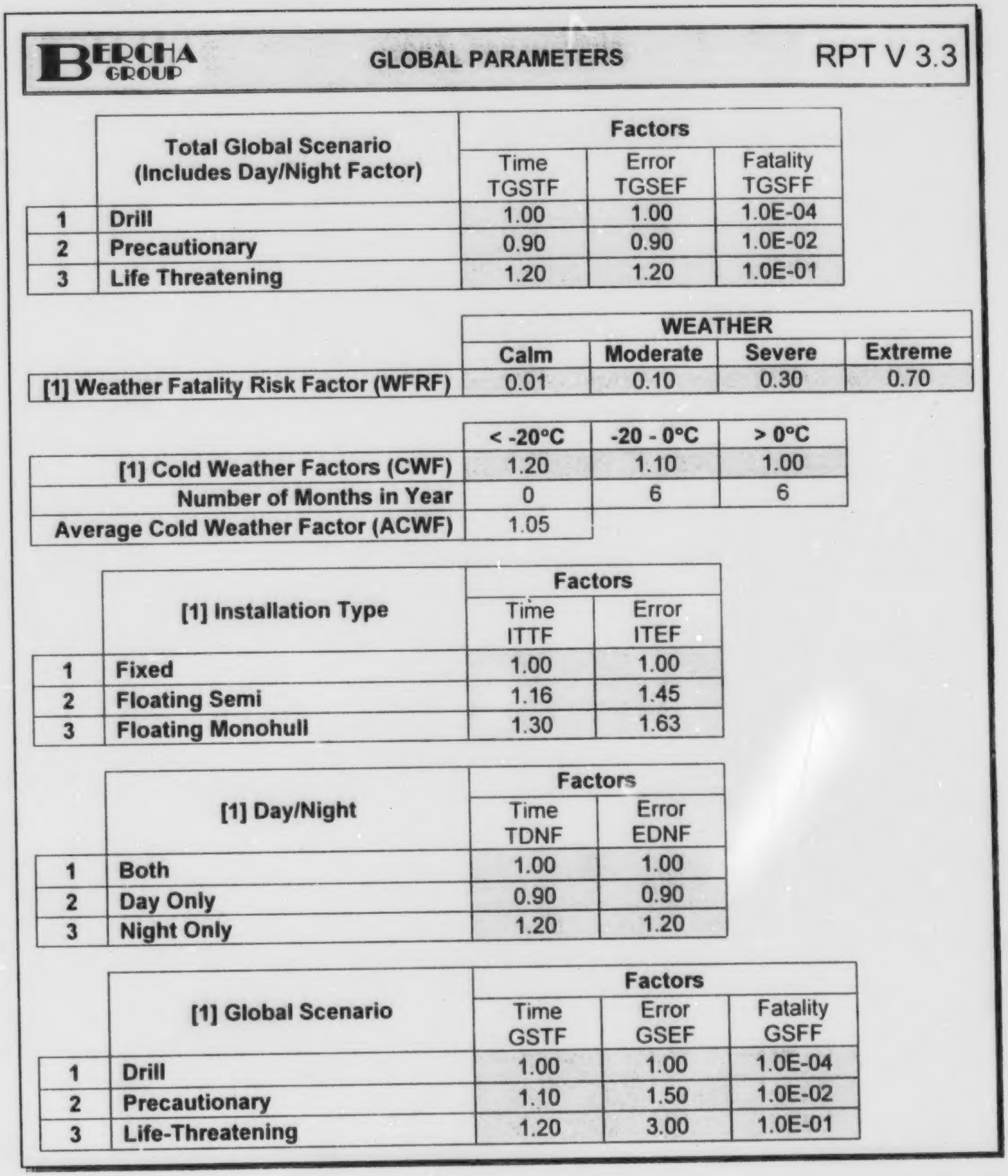
These factors are used to transform the base case values to those associated with different situations. These factors were evaluated through a combination of industry information and expert opinion. However, as will be seen in the conclusions and recommendations, work remains to be done on these.

Escape parameters

The escape parameters are largely unit rates of progress start-up times associated with different aspects of the escape process, together with factors that generally exacerbate the rates of progress or error rates associated with different conditions. These are displayed in Figure 3.22.

Most of the escape parameters were evaluated through the HF experiments described in Chapter 4. Only Location Delay, Injury Factor, and Smoke Factor were based on other industry sources [28]. These will be addressed in more detail in the next phase of the work.

All things considered, the escape process is probably the easiest to model because it is relatively deterministic and founded on a relatively solid database, and because the integrity of the EER process is not highly sensitive to small variations in the escape time and reliability. That is, in most installations there is ample time to move to the TSR, considering modern designs with explosion protection, fire walls, route markers, and drill and technical support. Certainly, escape modelling is a subject for further discussion; however, operators have expressed the opinion that in general, the escape component of the EER process is well within safe limits and extensive resources should not be dedicated to its more detailed modelling.



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	Total Global Scenario (Includes Day/Night Factor)	Factors		
		Time TGSTF	Error TGSEF	Fatality TGSFF
1	Drill	1.00	1.00	1.0E-04
2	Precautionary	0.90	0.90	1.0E-02
3	Life Threatening	1.20	1.20	1.0E-01

	WEATHER			
	Calm	Moderate	Severe	Extreme
[1] Weather Fatality Risk Factor (WFRF)	0.01	0.10	0.30	0.70

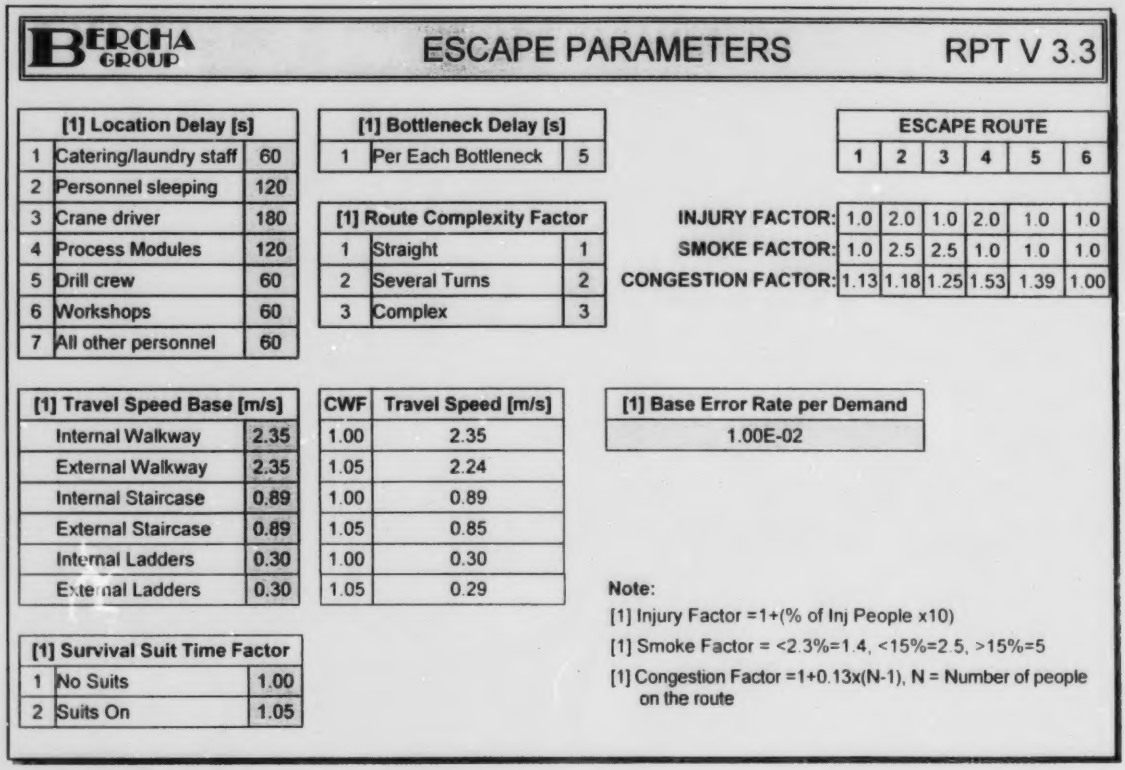
	< -20°C	-20 - 0°C	> 0°C
[1] Cold Weather Factors (CWF)	1.20	1.10	1.00
Number of Months in Year	0	6	6
Average Cold Weather Factor (ACWF)	1.05		

	[1] Installation Type	Factors	
		Time ITTF	Error ITEF
1	Fixed	1.00	1.00
2	Floating Semi	1.16	1.45
3	Floating Monohull	1.30	1.63

	[1] Day/Night	Factors	
		Time TDNF	Error EDNF
1	Both	1.00	1.00
2	Day Only	0.90	0.90
3	Night Only	1.20	1.20

	[1] Global Scenario	Factors		
		Time GSTF	Error GSEF	Fatality GSFF
1	Drill	1.00	1.00	1.0E-04
2	Precautionary	1.10	1.50	1.0E-02
3	Life-Threatening	1.20	3.00	1.0E-01

Figure 3.21 Global parameters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ESCAPE PARAMETERS

RPT V 3.3

[1] Location Delay [s]		
1	Catering/laundry staff	60
2	Personnel sleeping	120
3	Crane driver	180
4	Process Modules	120
5	Drill crew	60
6	Workshops	60
7	All other personnel	60

[1] Bottleneck Delay [s]		
1	Per Each Bottleneck	5

[1] Route Complexity Factor		
1	Straight	1
2	Several Turns	2
3	Complex	3

	ESCAPE ROUTE					
	1	2	3	4	5	6
INJURY FACTOR:	1.0	2.0	1.0	2.0	1.0	1.0
SMOKE FACTOR:	1.0	2.5	2.5	1.0	1.0	1.0
CONGESTION FACTOR:	1.13	1.18	1.25	1.53	1.39	1.00

[1] Travel Speed Base [m/s]		CWF	Travel Speed [m/s]
Internal Walkway	2.35	1.00	2.35
External Walkway	2.35	1.05	2.24
Internal Staircase	0.89	1.00	0.89
External Staircase	0.89	1.05	0.85
Internal Ladders	0.30	1.00	0.30
External Ladders	0.30	1.05	0.29

[1] Base Error Rate per Demand
1.00E-02

[1] Survival Suit Time Factor		
1	No Suits	1.00
2	Suits On	1.05

Note:

[1] Injury Factor =1+(% of Inj People x10)

[1] Smoke Factor = <2.3%=1.4, <15%=2.5, >15%=5

[1] Congestion Factor =1+0.13x(N-1), N = Number of people on the route

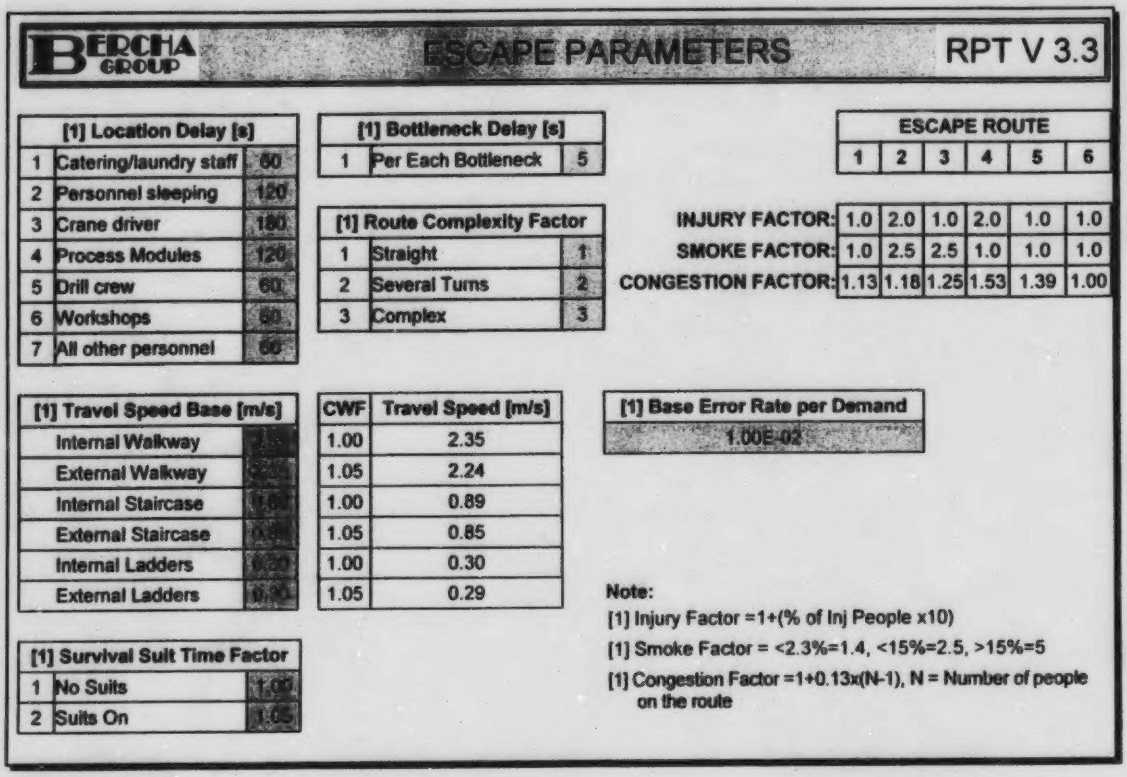
Figure 3.22 Escape parameters

Evacuation parameters

The evacuation parameters consist of general evacuation parameters and evacuation mode-specific parameters.

Figure 3.23 shows the general evacuation parameters, which are essentially time and error factors relating to each installation type. They are the Evacuation Installation Type Time Factor (EVITTF) and the corresponding Error Factor (EVITEF). Although these installation type time and error factors could in some cases be considered the same as the corresponding global installation type factors, in general they should not be expected to be the same, and accordingly are specified under a separate evacuation sub-screen (Figure 3.2.3).

Next are the evacuation mode-specific risk and time factors, chosen for the Skyscape system to illustrate their general configuration, as displayed in Figure 3.24. The activity weather time factors are relatively simple. For the calm base case, which is a drill situation, the activity weather time factor is multiplied by the base activity time to give the expected activity time in the expected value RPT.



ESCAPE PARAMETERS RPT V 3.3

[1] Location Delay [s]		
1	Catering/laundry staff	60
2	Personnel sleeping	120
3	Crane driver	180
4	Process Modules	120
5	Drill crew	60
6	Workshops	60
7	All other personnel	60

[1] Bottleneck Delay [s]		
1	Per Each Bottleneck	5

[1] Route Complexity Factor		
1	Straight	1
2	Several Turns	2
3	Complex	3

	ESCAPE ROUTE					
	1	2	3	4	5	6
INJURY FACTOR:	1.0	2.0	1.0	2.0	1.0	1.0
SMOKE FACTOR:	1.0	2.5	2.5	1.0	1.0	1.0
CONGESTION FACTOR:	1.13	1.18	1.25	1.53	1.39	1.00

[1] Travel Speed Base [m/s]		CWF	Travel Speed [m/s]
Internal Walkway	[illegible]	1.00	2.35
External Walkway	[illegible]	1.05	2.24
Internal Staircase	[illegible]	1.00	0.89
External Staircase	[illegible]	1.05	0.85
Internal Ladders	0.30	1.00	0.30
External Ladders	[illegible]	1.05	0.29

[1] Base Error Rate per Demand
1.00E-02

[1] Survival Suit Time Factor		
1	No Suits	1.00
2	Suits On	1.05

Note:
[1] Injury Factor =1+(% of Inj People x10)
[1] Smoke Factor = <2.3%=1.4, <15%=2.5, >15%=5
[1] Congestion Factor =1+0.13x(N-1), N = Number of people on the route

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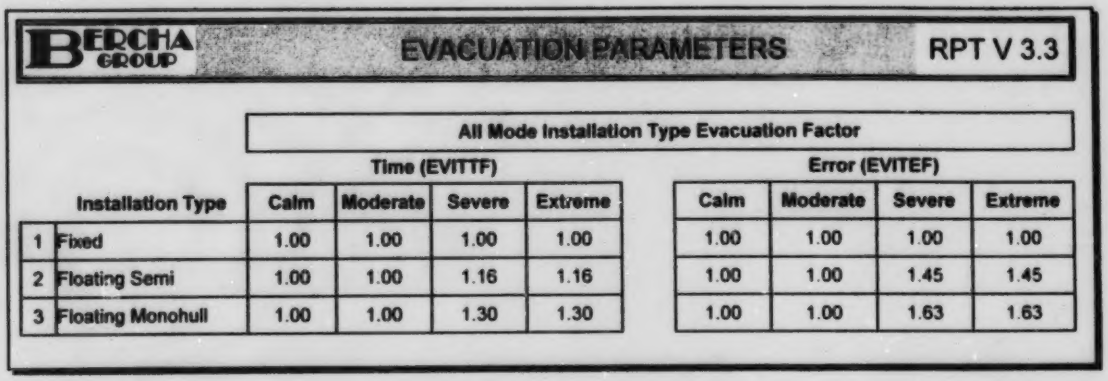

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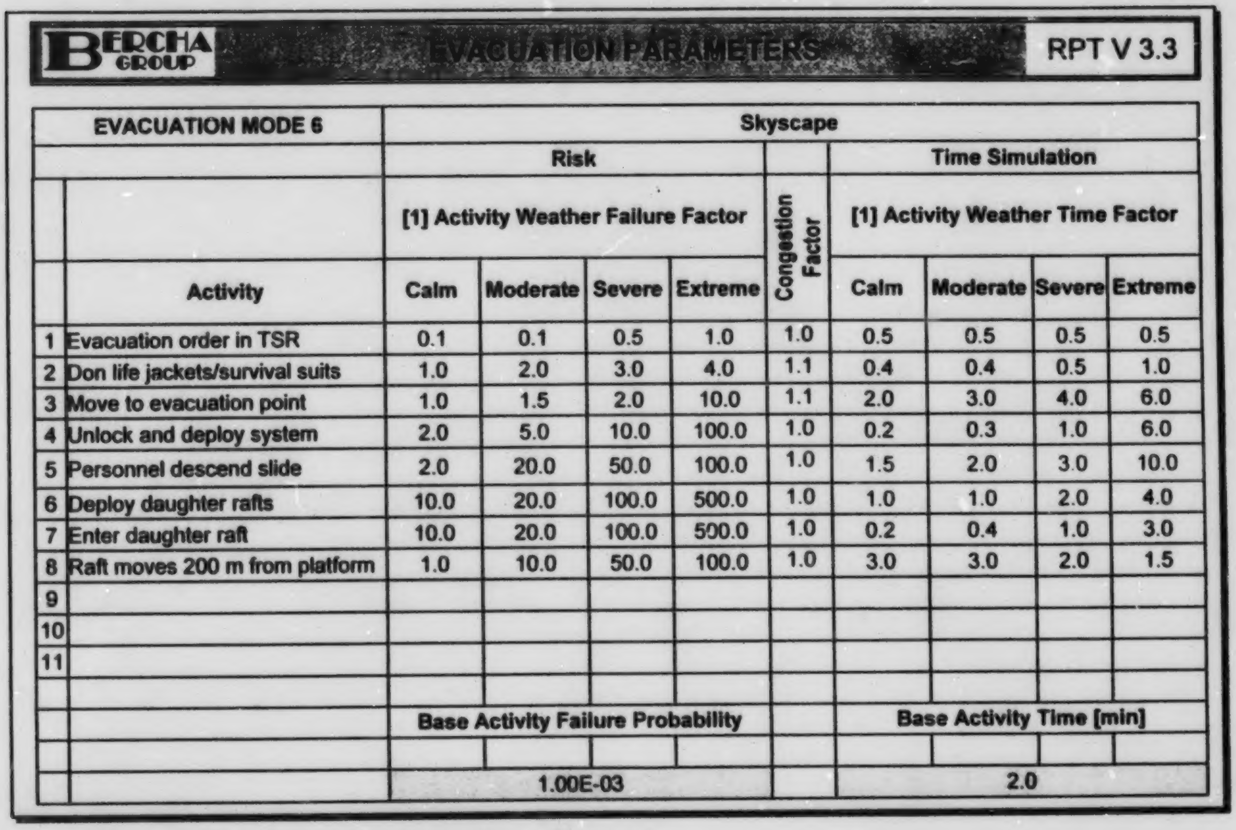
All Mode Installation Type Evacuation Factor

	Installation Type	Time (EVITTF) Calm	Time (EVITTF) Moderate	Time (EVITTF) Severe	Time (EVITTF) Extreme	Error (EVITEF) Calm	Error (EVITEF) Moderate	Error (EVITEF) Severe	Error (EVITEF) Extreme
1	Fixed	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
2	Floating Semi	1.00	1.00	1.16	1.16	1.00	1.00	1.45	1.45
3	Floating Monohull	1.00	1.00	1.30	1.30	1.00	1.00	1.63	1.63

Figure 3.23 General evacuation parameters



BERCHA GROUP EVACUATION PARAMETERS RPT V 3.3

EVACUATION MODE 6		Skyscape								
		Risk					Time Simulation			
		[1] Activity Weather Failure Factor				Congestion Factor	[1] Activity Weather Time Factor			
	Activity	Calm	Moderate	Severe	Extreme		Calm	Moderate	Severe	Extreme
1	Evacuation order in TSR	0.1	0.1	0.5	1.0	1.0	0.5	0.5	0.5	0.5
2	Don life jackets/survival suits	1.0	2.0	3.0	4.0	1.1	0.4	0.4	0.5	1.0
3	Move to evacuation point	1.0	1.5	2.0	10.0	1.1	2.0	3.0	4.0	6.0
4	Unlock and deploy system	2.0	5.0	10.0	100.0	1.0	0.2	0.3	1.0	6.0
5	Personnel descend slide	2.0	20.0	50.0	100.0	1.0	1.5	2.0	3.0	10.0
6	Deploy daughter rafts	10.0	20.0	100.0	500.0	1.0	1.0	1.0	2.0	4.0
7	Enter daughter raft	10.0	20.0	100.0	500.0	1.0	0.2	0.4	1.0	3.0
8	Raft moves 200 m from platform	1.0	10.0	50.0	100.0	1.0	3.0	3.0	2.0	1.5
9										
10										
11										
		Base Activity Failure Probability					Base Activity Time [min]			
		1.00E-03					2.0			

Figure 3.24 Evacuation parameters – Skyscape

Thus, for example, *Activity 1* is expected to take 1 minute (the product of the factor of 0.5 and the base activity time of 2 minutes). The base activity times were derived from the HF experiments described in Chapter 4. Extrapolation of these activity times to moderate, severe, and extreme was carried out analytically in conjunction with expert opinion (from Survival Systems experts) and common sense.

A similar approach applies to the activity weather failure factors (on left side of Figure 3.2.4). Again, the actual activity failure is obtained by multiplying the activity weather failure factor for a combination of each activity and weather condition by the base activity failure probability. The base or calm weather case here was estimated from industrial performance data [28, 43]. Again, its extrapolation for different weather types was conducted through a combination of analysis and expert opinion.

Rescue parameters

Figure 3.25 shows the rescue parameters required for each chosen combination of evacuation mode and rescue mode. The rescue parameter gives the probability of success that under the given condition, the selected evacuation mode evacuees are likely to be rescued using the selected rescue mode. Thus, for example, for the Skyscape (Mode 6) there is a 70 percent probability that a rescue can be effected in moderate weather using a standby vessel.

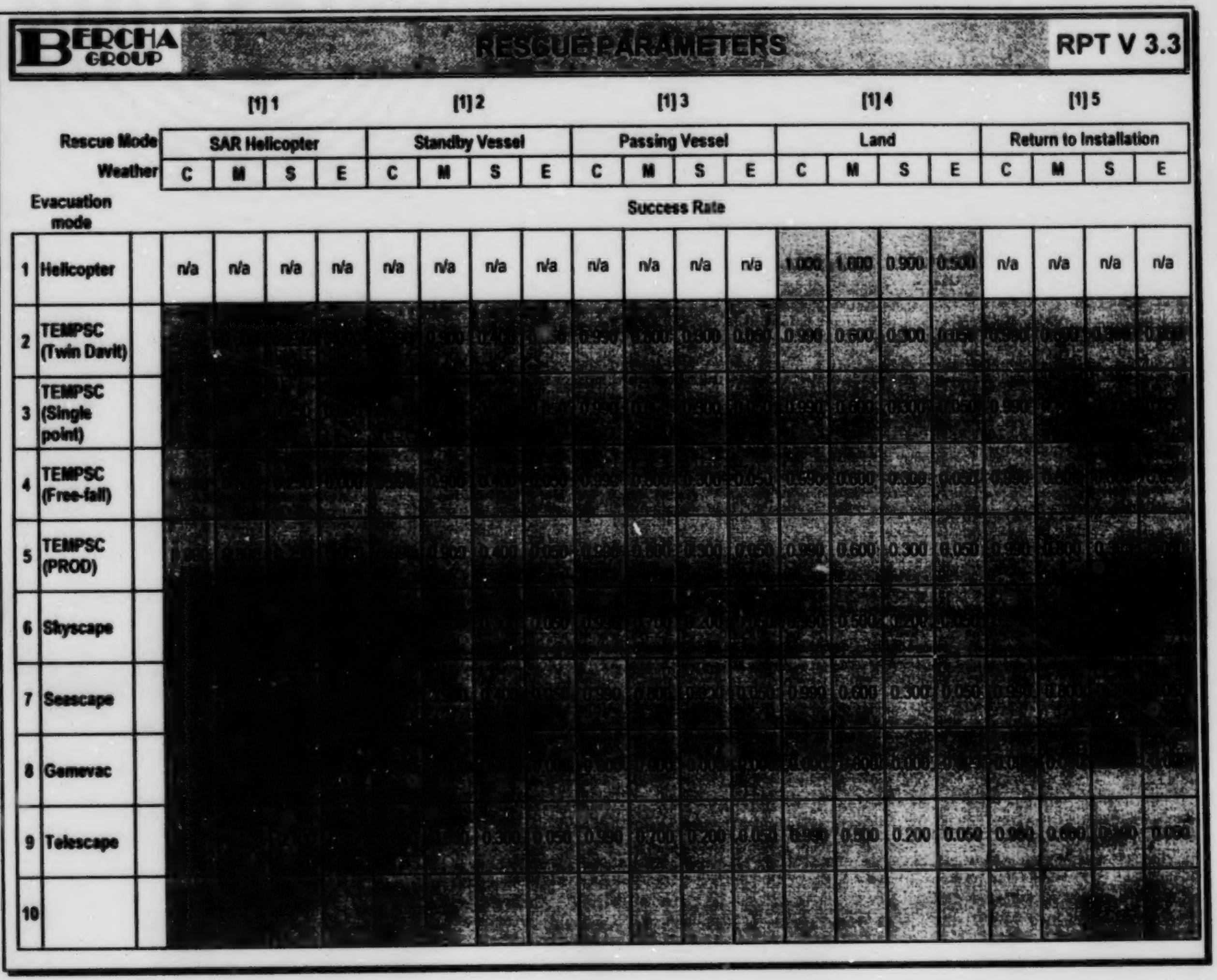
The basis for these rescue parameters is a combination of full-scale data from industry sources, expert opinion, and analysis and extrapolation with the assistance of expert opinion from those data points established to ones established for which there are no data.

3.4.3 Model Validation

Ideally, model validation would be carried out through the simulation of a complete EER drill that was fully documented, both qualitatively and quantitatively. Such documentation would necessarily include personnel type and distribution, their detailed performance (time and error quantitative documentation) throughout the exercise, and quantitative details (time and geometry) of all systems and associated operational and environmental conditions. This is essentially what was evaluated through the HF experiments described in Chapter 4, but was not available for a complete EER situation.

In an attempt to secure potential validation data, the following sources were contacted by members of either the Project Team or the Steering Committee:

- SOEP
- Secunda Marine (part of Project Team)
- Hibernia
- Terra Nova
- PanCanadian
- Norsk Hydro



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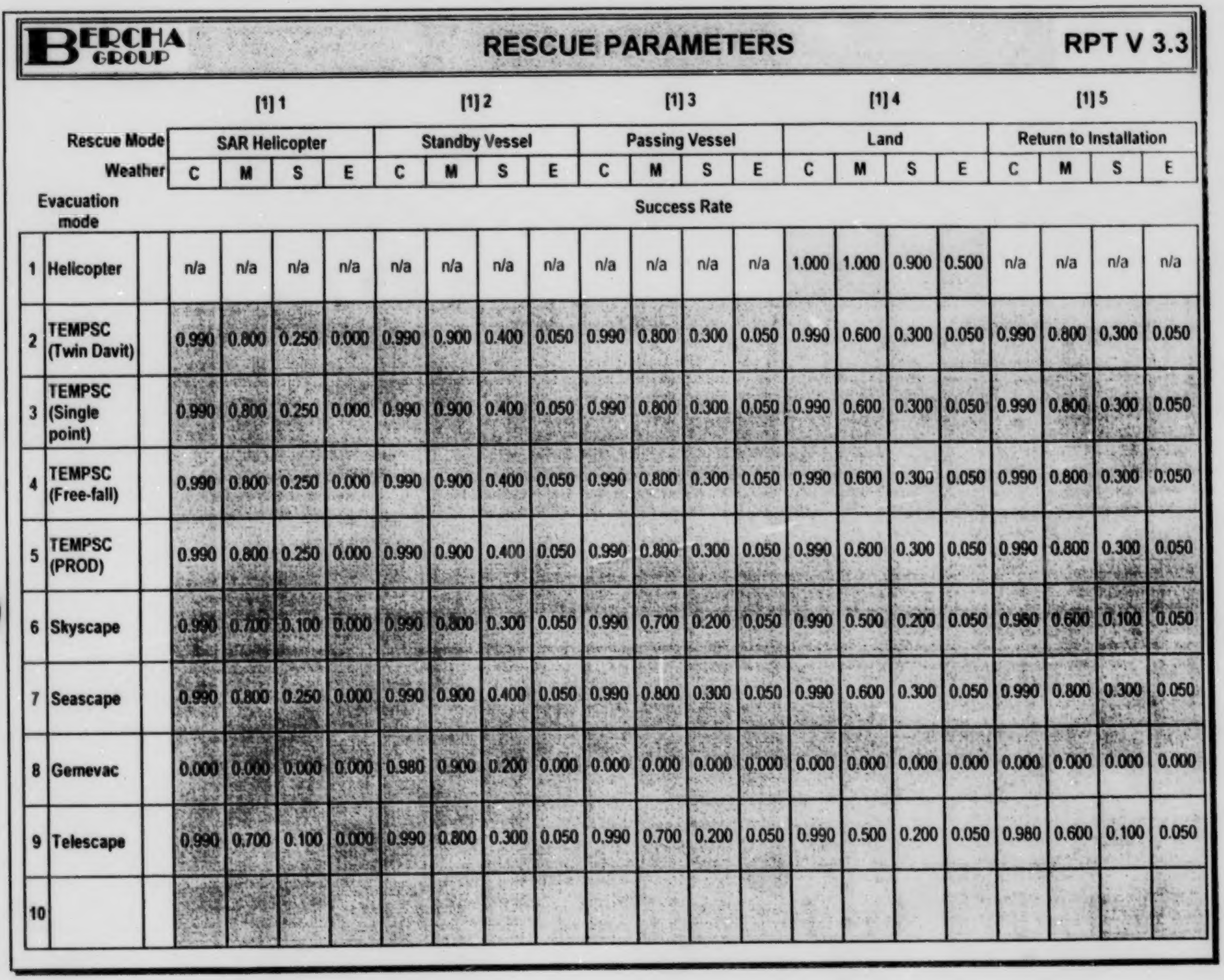
RESCUE PARAMETERS

RPT V 3.3

		[1] 1				[1] 2				[1] 3				[1] 4				[1] 5			
	Rescue Mode	SAR Helicopter				Standby Vessel				Passing Vessel				Land				Return to Installation			
	Weather	C	M	S	E	C	M	S	E	C	M	S	E	C	M	S	E	C	M	S	E
Evacuation mode		Success Rate																			
1	Helicopter	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1.000	1.000	0.900	0.500	n/a	n/a	n/a	n/a
2	TEMPSC (Twin Davit)	[illegible]	[illegible]	[illegible]	[illegible]	0.990	0.900	0.400	[illegible]	0.990	0.600	0.300	0.050	0.990	0.600	0.300	0.050	0.990	[illegible]	[illegible]	[illegible]
3	TEMPSC (Single point)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.990	[illegible]	0.300	0.050	0.990	0.600	0.300	0.050	0.990	[illegible]	[illegible]	[illegible]
4	TEMPSC (Free-fall)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.900	0.400	0.050	0.990	0.600	0.300	0.050	0.990	0.600	0.300	0.050	0.990	[illegible]	[illegible]	[illegible]
5	TEMPSC (PROD)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.900	0.400	0.050	0.990	0.600	0.300	0.050	0.990	0.600	0.300	0.050	0.990	0.600	[illegible]	[illegible]
6	Skyscape	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.050	0.990	0.700	0.200	0.050	0.990	0.500	0.200	0.050	[illegible]	[illegible]	[illegible]	[illegible]
7	Seascape	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.050	0.990	0.600	[illegible]	0.050	0.990	0.600	0.300	0.050	0.990	[illegible]	[illegible]	[illegible]
8	Gemevac	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
9	Telescape	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.300	0.050	0.990	0.700	0.200	0.050	0.990	0.500	0.200	0.050	0.980	0.600	[illegible]	0.050
10																					

Figure 3.25 Rescue parameters



BERCHA GROUP — **RESCUE PARAMETERS** — **RPT V 3.3**

			[1] 1				[1] 2				[1] 3				[1] 4				[1] 5			
Rescue Mode			SAR Helicopter				Standby Vessel				Passing Vessel				Land				Return to Installation			
Weather			C	M	S	E	C	M	S	E	C	M	S	E	C	M	S	E	C	M	S	E
Evacuation mode			Success Rate																			
1	Helicopter		n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1.000	1.000	0.900	0.500	n/a	n/a	n/a	n/a
2	TEMPSC (Twin Davit)		0.990	0.800	0.250	0.000	0.990	0.900	0.400	0.050	0.990	0.800	0.300	0.050	0.990	0.600	0.300	0.050	0.990	0.800	0.300	0.050
3	TEMPSC (Single point)		0.990	0.800	0.250	0.000	0.990	0.900	0.400	0.050	0.990	0.800	0.300	0.050	0.990	0.600	0.300	0.050	0.990	0.800	0.300	0.050
4	TEMPSC (Free-fall)		0.990	0.800	0.250	0.000	0.990	0.900	0.400	0.050	0.990	0.800	0.300	0.050	0.990	0.600	0.300	0.050	0.990	0.800	0.300	0.050
5	TEMPSC (PROD)		0.990	0.800	0.250	0.000	0.990	0.900	0.400	0.050	0.990	0.800	0.300	0.050	0.990	0.600	0.300	0.050	0.990	0.800	0.300	0.050
6	Skyscape		0.990	0.700	0.100	0.000	0.990	0.800	0.300	0.050	0.990	0.700	0.200	0.050	0.990	0.500	0.200	0.050	0.980	0.600	0.100	0.050
7	Seascape		0.990	0.800	0.250	0.000	0.990	0.900	0.400	0.050	0.990	0.800	0.300	0.050	0.990	0.600	0.300	0.050	0.990	0.800	0.300	0.050
8	Gemevac		0.000	0.000	0.000	0.000	0.980	0.900	0.200	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
9	Telescape		0.990	0.700	0.100	0.000	0.990	0.800	0.300	0.050	0.990	0.700	0.200	0.050	0.990	0.500	0.200	0.050	0.980	0.600	0.100	0.050
10																						

Figure 3.25 Rescue parameters

The results varied as follows:

- SOEP - Provided extensive data in the form of studies and information (see Table 2.14), but because of their relatively short operating history since operations commenced in January of 2000, only a limited number of escape drill results were provided. Fortunately, the necessary quantitative information characterizing the installation was not substantially different from that used in the case studies described in Chapter 5; therefore, these data could be rigorously used in the validation.
- Secunda Marine - Provided extensive data in the form of emergency drill logs for fire, muster, and MOB drills, and documented several of these so that they could be used directly for RPT validation purposes.
- Hibernia - Provided only partial data on total muster times for several muster drills, without documentation on initial component distribution, route geometries, and other documentation necessary to use these data for validation purposes.
- Terra Nova - Provided a partial copy of one EER study, but no data specific to floating production storage and offloading (FPSO).
- PanCanadian - Provided numerous fire, accident, and muster drill reports, with some documentation, allowing these data to be used with assumptions.
- Norsk Hydro - Did not respond to the request for EER data.

From all of the above, the most applicable data were the SOEP muster data and the Secunda drill data. The PanCanadian data could also be used with some estimating for the escape conditions.

Table 3.4 summarizes the results of nine illustrative validation runs of the RPT. All RPT runs were run in the Monte Carlo mode so that variants could be directly obtained from the CDF. From left to right, the table gives the following:

- Run item number
- EER component validated
- Description of data
- Total time from the data
- RPT-calculated expected (50 percent) total time
- Locations of time from the data on the RPT-generated CDF
- Variance between data time and RPT expected time

Table 3.4 Model result validation summary

No.	EER COMPONENT	DESCRIPTION OF DATA		DATA TIME (min.)	RPT TIME (min.)	DATA CDF %	VARIANCE %
1	Escape	SOEP muster to TSR		10.5	11.2	38	12
2				14.0	13.3	70	20
3	Escape	Secunda muster & fire drills		15.0	14.2	65	15
4				10.0	11.2	39	11
5	Escape	PanCanadian NS drills	Fire	29	34	36	14
6			Abandon	13	14.5	33	17
7			Abandon	09	14.5	33	17
8	Rescue	Secunda MOB rescue	Dacon scoop	38	34	68	18
9			FRC	06	08	24	26
Average Variance:							***16.7***

The variance is the key validation parameter; high variance suggests bad correlation, while low variance suggests good correlation. The variance ranges from 11 to 26 percent, with a numerical average of 17 percent. Any value below 20 percent shows excellent correlation [43]; thus, the average performance of the RPT for this restricted set of validations can be considered very good. The validations are restricted because, except for the two Secunda rescue data sets (which have an average variance of 22 percent), all data sets were for the relatively deterministic escape component. Variance for modelling of the escape component should be quite low, as is the case here. It is, however, encouraging that the variance for the two rescue scenarios, in which the RPT was run in a custom mode, is also relatively low at 22 percent. It should be noted that evacuation validation runs were not included because the evacuation data for TEMPSCs received from Umoe Schat-Harding was, in fact, used as a basis for setting the evacuation parameters. Since the full-scale evacuation data is the building block of the associated evacuation modules, it would be pointless to then use it for validation runs as these would necessarily give virtually no variance.

3.4.4 Conclusion on RPT Validation

In general, it can be said that both the parameter validations that were conducted and the model validations for selected EER components suggest that the RPT, particularly in the Monte Carlo mode, is very promising and functions well for the simulation of relatively simple drill situations. Its application to real life-threatening emergencies, however, although based on a good foundation, still requires further development work before it can be claimed to provide sufficiently reliable results for use as a basis for performance-based standard development.

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4. EER HUMAN FACTORS EXPERIMENTS

4.1 General Introduction

4.1.1 Experiment Schedule and Location

The first set of human factors experiments, the summer trials, were held at Survival Systems' facilities in Dartmouth, Nova Scotia, on November 14, 2000 (please see Section 4.2). The winter experiments were staged February 13, 2001, and are described in Section 4.3, with additional details in [9].

4.1.2 Survival Systems Facilities

Summer experiments took place both indoors, at Survival Systems' office/laboratory facility on Mount Hope Avenue, and outdoors at the Survival Systems training facility, a tower on the shores of Halifax Harbour. Winter experiments were staged exclusively at the training tower.

Figure 4.1 shows a photograph of the tower, with some of the main locations identified. The entry to the TR is shown in Figure 4.2. Figure 4.3 shows a detail of the entry to the Skyscape containment structure at location S6. Figure 4.4 gives a schematic of the main facility, identifying the main locations. Figure 4.5 is a schematic of the walkway facility, showing the main locations. The bottleneck – a simulated hatch – is located at W2.

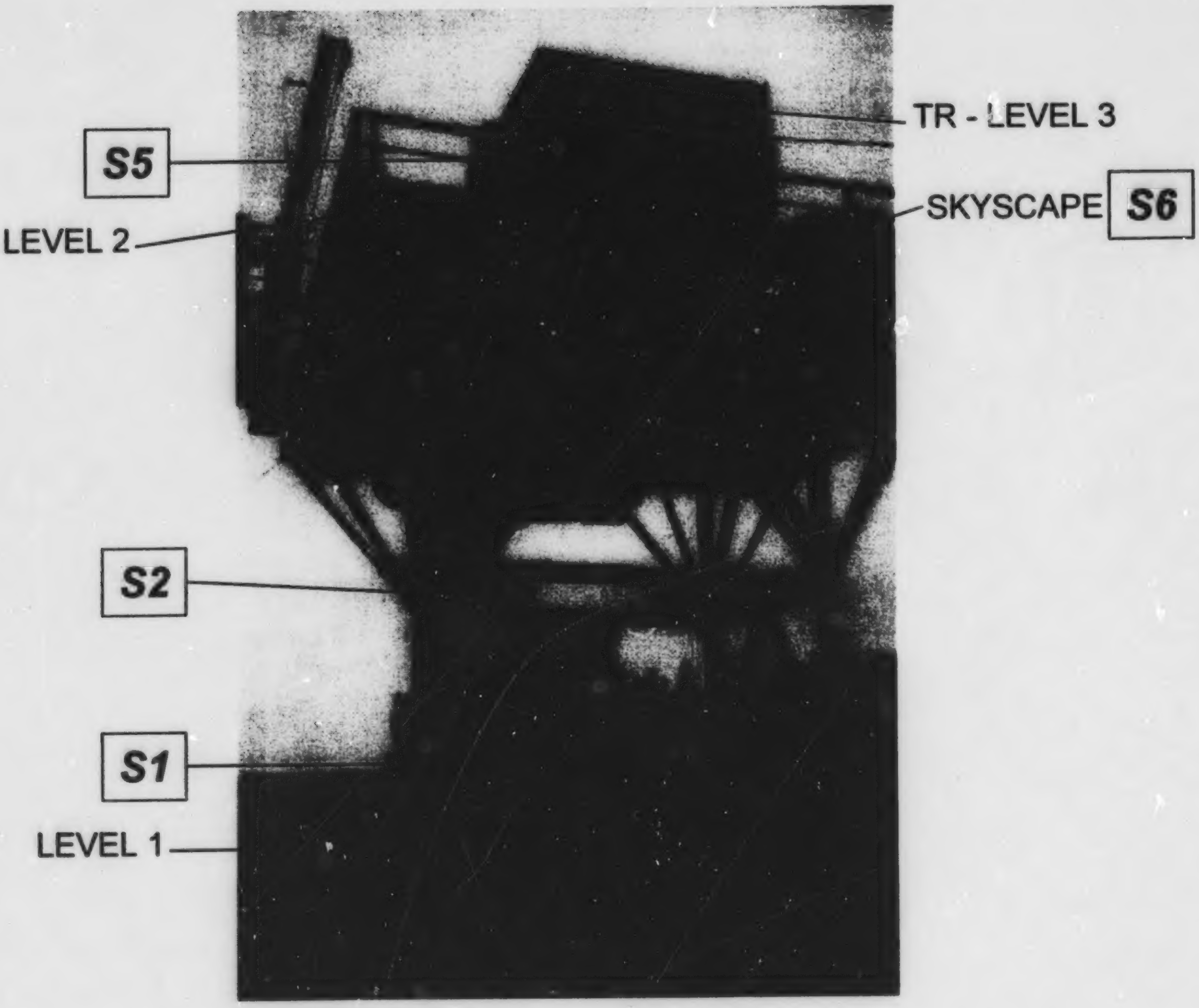

S5
LEVEL 2
TR - LEVEL 3
SKYSCAPE
S6
S2
S1
LEVEL 1

Figure 4.1 Main facility

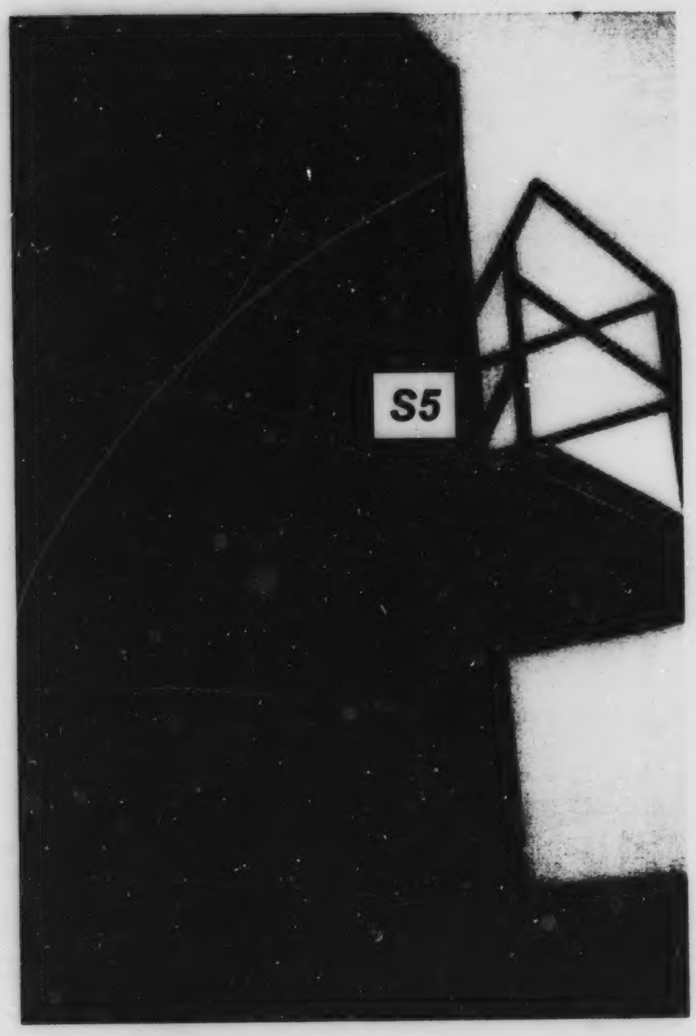


Figure 4.2 TR entry

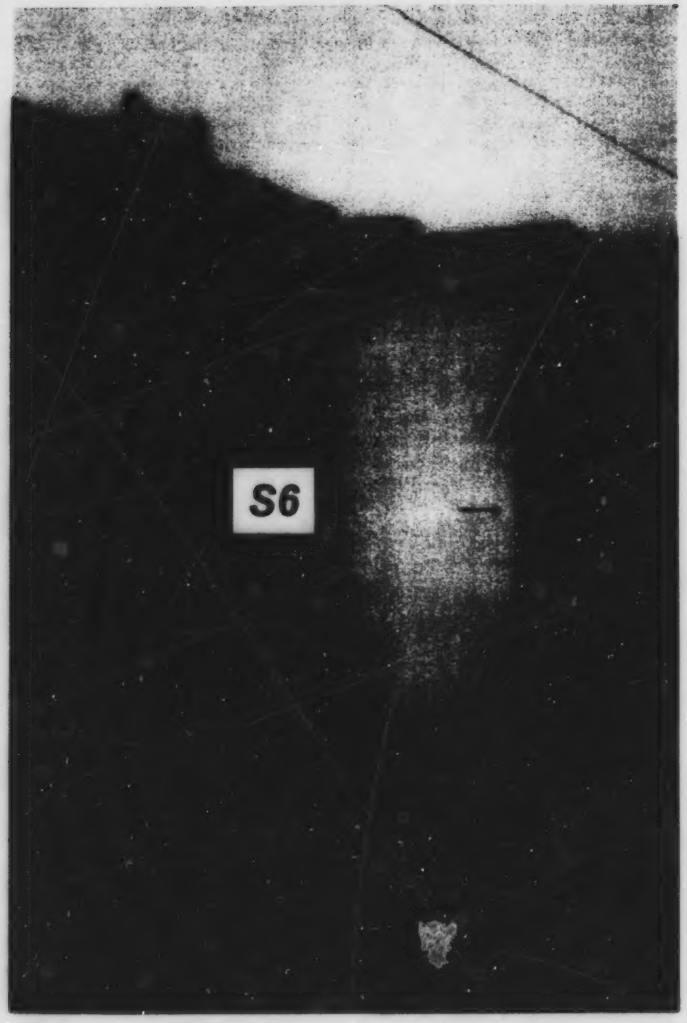
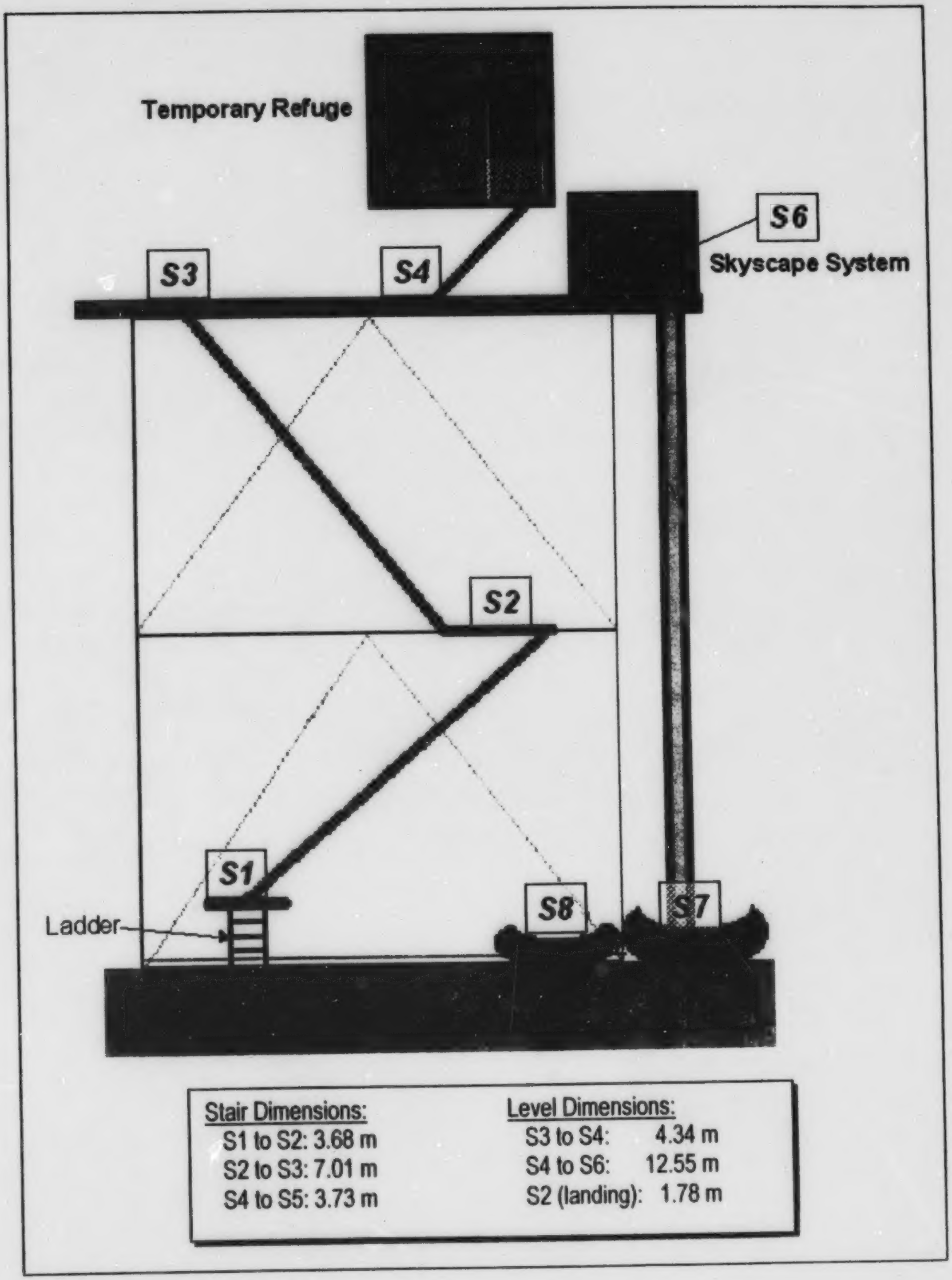


Figure 4.3 Skyscape entrance


Temporary Refuge
S6
Skyscape System
S3
S4
S2
S1
Ladder
S8
S7

Stair Dimensions:
S1 to S2: 3.68 m
S2 to S3: 7.01 m
S4 to S5: 3.73 m

Level Dimensions:
S3 to S4: 4.34 m
S4 to S6: 12.55 m
S2 (landing): 1.78 m

Figure 4.4 Facility schematic

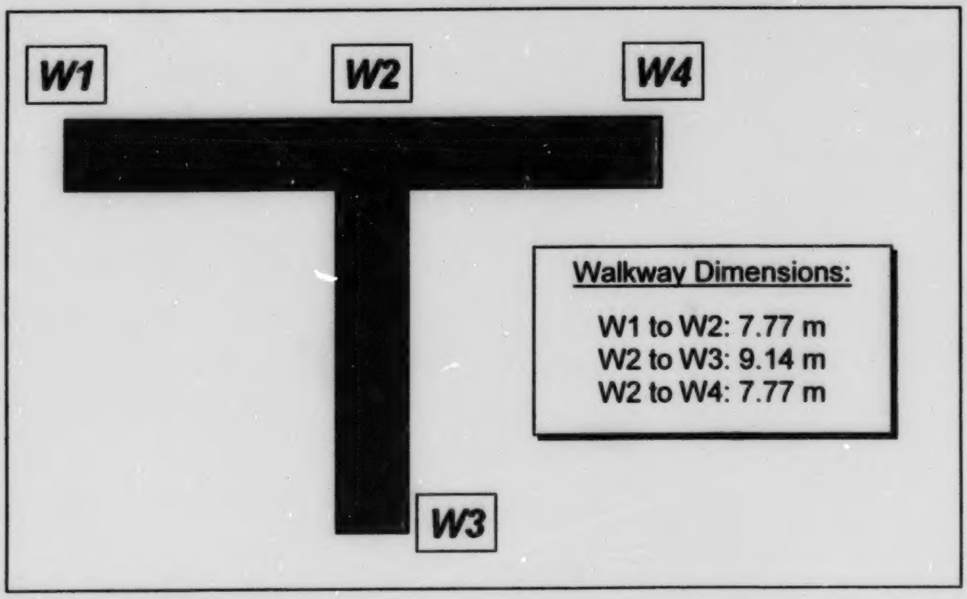


Figure 4.5 Walkway schematic

4.1.3 Escape Parameters for RPT (Model)

Initial delay

Defined as the time taken in seconds from the moment the alarm is sounded to the moment the subject begins to escape actively, *initial delay* varies with the following:

- Sleeping
- Laundry staff
- Staff on bridge
- Marine operators
- Roughnecks on drill deck

As fairly good information from industry sources is available on these initial delays (see Table 3.1), attempts were not made to measure them.

Don survival suit

A series of experiments was conducted to estimate individual and group times for putting on survival suits. For individual times, the *don survival suit time* was taken from the time of alarm until the individual was dressed, while for groups, the time was taken from the alarm until the last individual was dressed. Provision was made for the possibility of an individual having great difficulty in dressing and taking far longer than any of the others (a note would be made of this and the time recorded when most of the group was dressed and when the outstanding individual had completed dressing). The following situations for donning survival suits were tested:

- Inside
    - Individual alone
    - Group of 10 individuals in TR
- Outside
    - Alone – only for limited numbers of single individuals, if environment is sufficiently severe (wind, rain, etc.).

Rate of movement

The RPT requires the following rate of movement (metres/second) parameters:

- Internal walkways
- External walkways
- Stairways
- Bottlenecks (such as watertight doors, hatches, and regular installation doors)

The experiments were designed to obtain rates of movement for internal and external walkways, stairs, and bottlenecks. Internal walkways and bottlenecks were tested at Survival Systems' offices in November 2000; external walkways and bottlenecks were tested at the tower in February 2001. Stairs were tested at the tower on both dates.

Both individual times of progress (individuals without any interaction with groups) and groups of 10 were tested.

Rates of progress were measured with survival suits on, but a baseline without survival suits for a limited number of individuals and groups was also measured.

Congestion effect

Congestion effects occur either when there is a confluence of subjects (as would occur where they come together at a certain point from different directions), or when subjects come to a bottleneck or location (such as the top of the Skyscape) where only one individual can proceed at a time.

Congestion effects were studied as part of the group experiments.

4.1.4 Skyscape Evacuation Parameters for the RPT

The evacuation parameters needed for the modelling of RPT evacuations are the distributions of times for each of the sub-activities, which entail Skyscape evacuation. These sub-activities are described in subsection 4.2.4.

The parameters were evaluated for groups – with and without survival suits – and for individuals. The range of Skyscape experiments permitted the evaluation of the effects of wearing survival suits, congestion effects, and, of course, the human factors performance distribution times for each activity and the entire set of evacuation activities under different conditions. Experiments were carried out on two separate occasions (November 2000 and February 2001) to include a temperature differential.

4.1.5 Experiment Personnel

In November 2000, 30 subjects participated in the experiments, which were operated by approximately seventeen personnel as outlined below.

Principals:	Frank Bercha, Chris Brooks
Manager:	Peter Gibbs
Timers:	10 maximum
Camera Operators:	4

In February 2001, 10 subjects participated, necessitating fewer operational personnel. Chris Brooks served as principal.

4.2 Summer Experiment Descriptions

4.2.1 Survival Suit Experiments

At the whistle each subject removed a survival suit from its bag and began putting it on. Final completion time was when the subject was in the suit with the front zipper closed. All subjects practised donning the suit twice. Figure 4.6 shows a timed trial in progress.

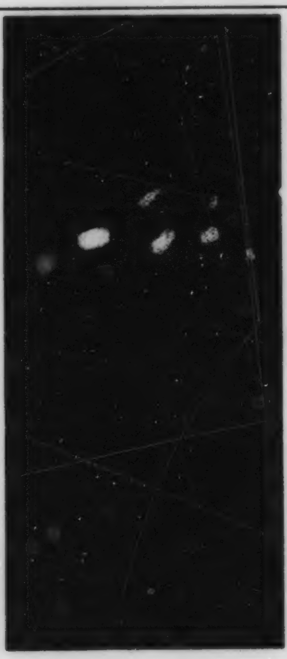


Figure 4.6 Donning survival suits during trials

4.2.2 Walkway Experiments

In November 2000, internal walkway experiments were carried out, using hallways in Survival Systems' offices, for groups and individuals with (Figure 4.7) and without (Figure 4.8) survival suits. For bottleneck experiments, a simulated hatch or door was installed as shown in Figure 4.9. Subjects were instructed to proceed in an orderly manner, as they would in the instance of an escape exercise on an installation. They did not race, push, or otherwise proceed in a manner hazardous to others.

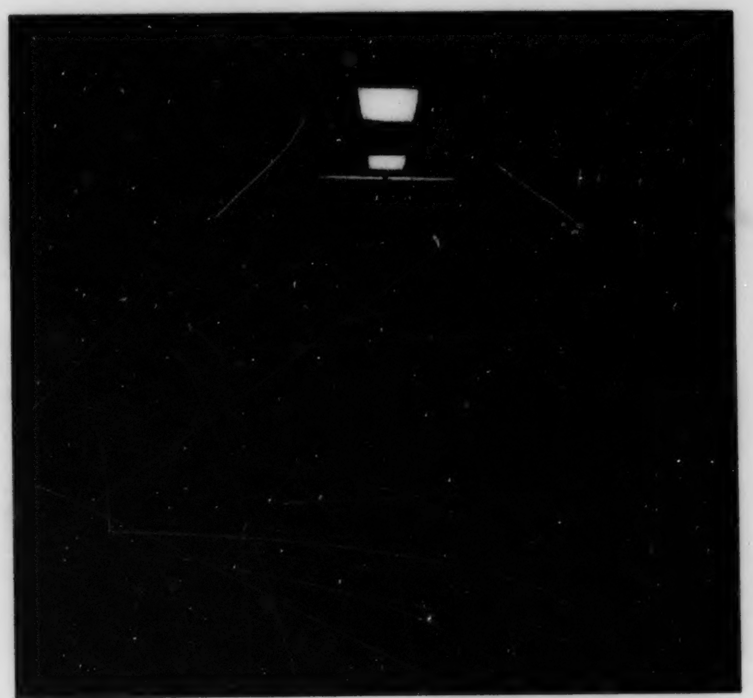


Figure 4.7 Walkway experiments with survival suits

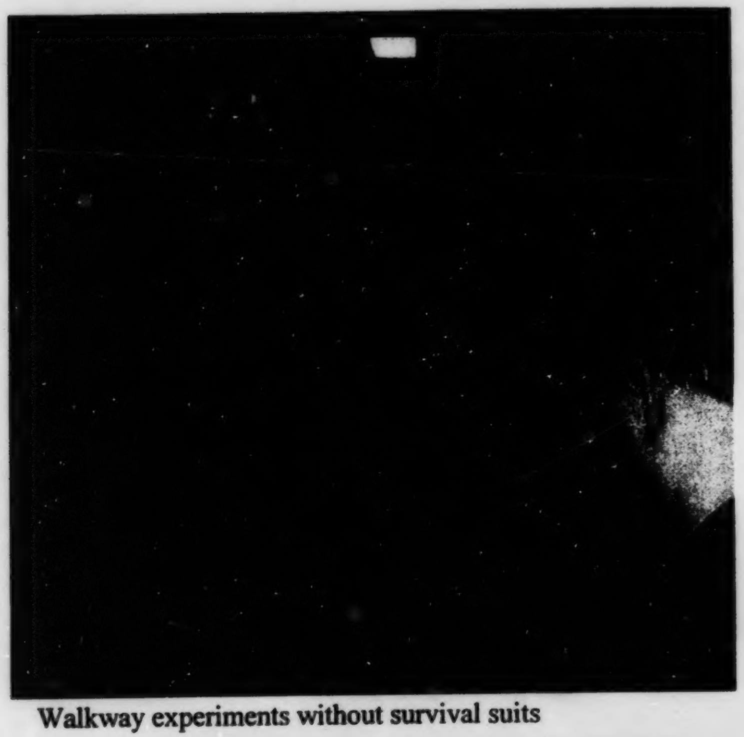


Figure 4.8 Walkway experiments without survival suits

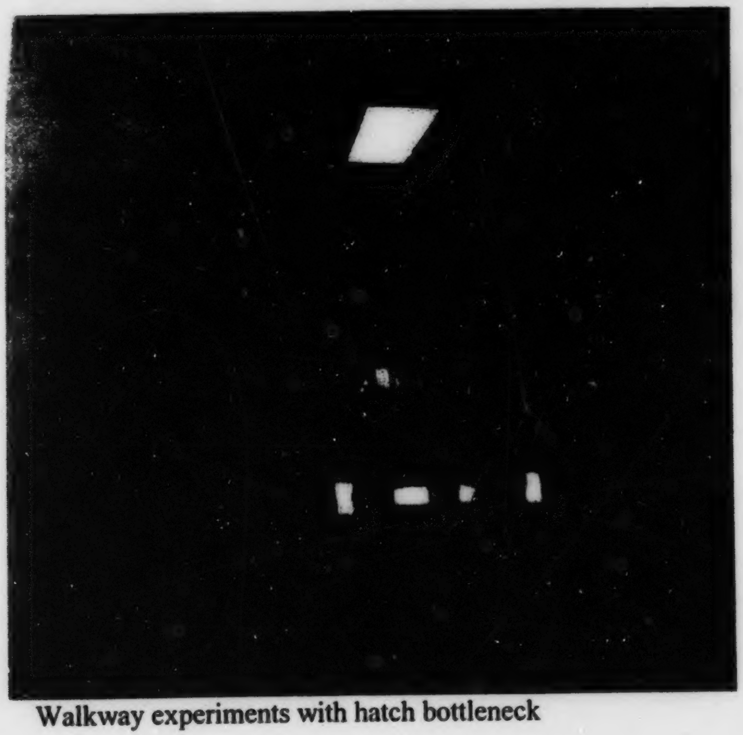


Figure 4.9 Walkway experiments with hatch bottleneck

4.2.3 Stair Experiments

The purpose of the stair experiments was to record rates of progress (obtained by dividing times by the distances along stairs covered) for individuals and groups. Three groups consisting of 10 individuals each (called Group A, Group B, and Group C) ran the trials. In all cases, subjects started at the top of the stairway (S3), descended to the bottom (S1), and returned to the top (S3). Times were recorded at each location for both individual and group trials. For groups, recorded times were: (i) the start whistle (0:00), (ii) when the last member reached the bottom (the first member going up could not begin until the last member had reached the bottom), and (iii) when the last member reached the top. Experiments were conducted both with and without survival suits. Figure 4.10 shows subjects in action on the stairs.

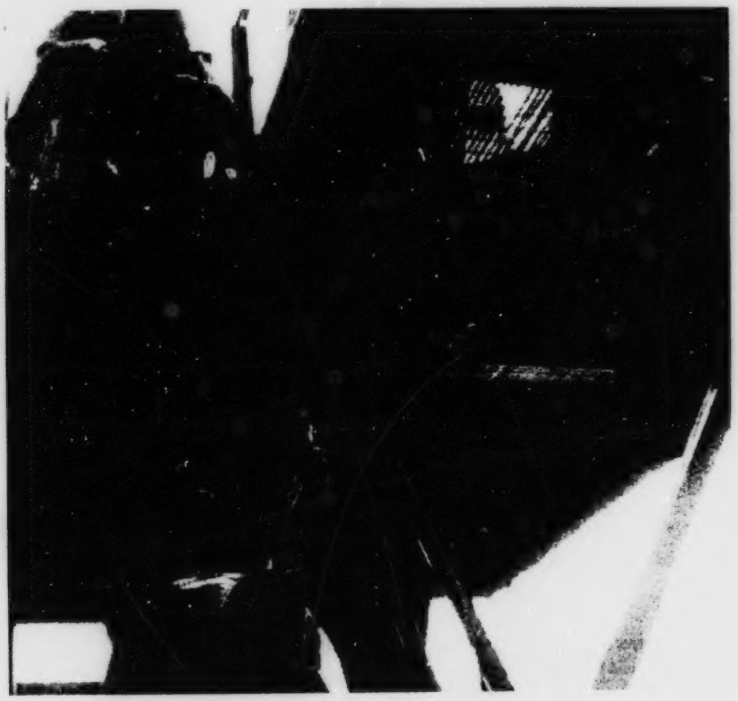


Figure 4.10 Subjects descend during group stair experiments with survival suits on

4.2.4 Skyscape Experiments

Following guided practice with and without survival suits, subject groups took part in Skyscape experiments for the following situations:

- No survival suits, starting from muster point (S6). The muster point is a location within or adjacent to the Skyscape enclosure. Groups A, B, and C successively.
- With survival suits from muster point (S6). Groups A, B, and C successively.
- With survival suits from TR (S5). Groups A, B, and C successively.
- With survival suits, direct to Skyscape from location at bottom landing (S1) of facility. Groups A, B, and C successively.
- With survival suits from muster point (S6). Groups A, B, and C all together.

Skyscape evacuation in its complete form consisted of the following principal experiments for which times were recorded:

1. Evacuation order (Time: 0:00)
2. Don survival suits *(not repeated in these Skyscape experiments).*
3. Move to embarkation point adjacent to Skyscape.
4. Unlock and deploy Skyscape *(performed separately).*
5. Start descent by subject #1.
6. Descent by subjects #1 and #2.
7. Subjects #1 and #2 deploy liferaft from mother raft.
8. Subjects #1 and #2 get into daughter raft (deployed raft).
9. Subjects #3 and #4 descend (and so on, to final subject).
10. Subjects #3 and #4 get into daughter raft (and so on, to final subject).
11. Last subject of group descends to mother raft.
12. Last subject of group gets into daughter raft.

Various activities of these Skyscape experiments are shown in Figures 4.11 to 4.15.

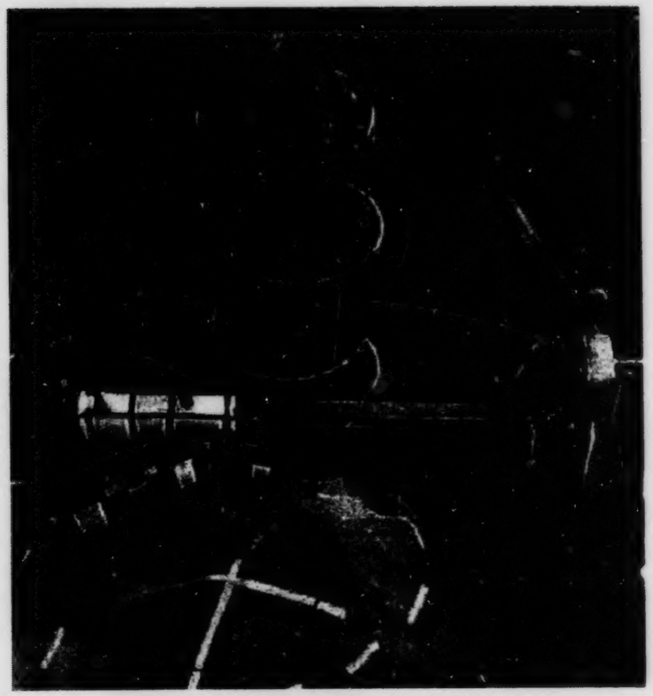


Figure 4.11 Skyscape experiments without survival suits

Figure 4.12 Skyscape experiments with survival suits

Figure 4.13 Exiting Skyscape

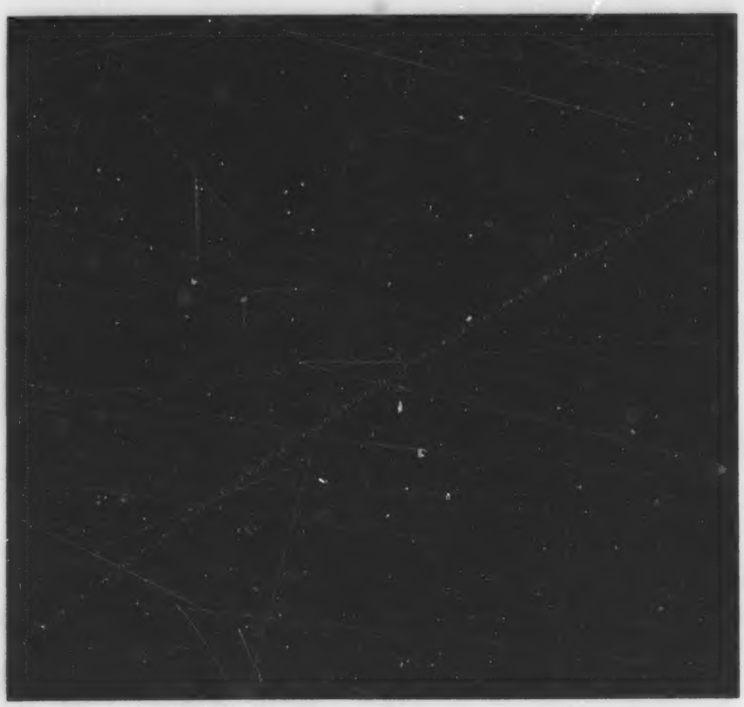


Figure 4.14 Subject headed for daughter raft

Figure 4.15 Subject entering daughter raft

4.3 Winter Experiment Descriptions

The winter experiments were carried out at the same facility as the summer experiments and consisted of stair experiments, walkway experiments (with and without hatches), and entry into a lifeboat. One group of ten individuals participated in the winter trials (Figure 4.16).

4.3.1 Stair Climb Up and Down

Essentially, the same experiments as those described in subsection 4.2.3 with survival suits on were carried out. Figure 4.17 shows subjects ready for the ascent.

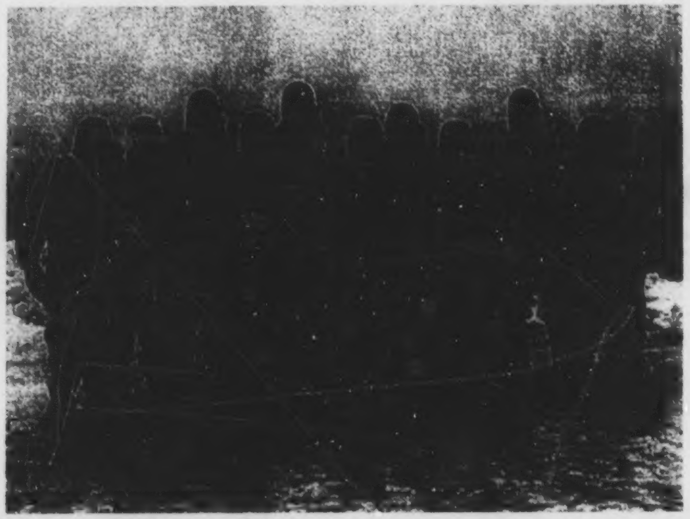


Figure 4.16 Winter experiment subjects

Figure 4.17 Subjects ready for stair climb

4.3.2 TR to Skyscape

During these trials, groups moved along a combination of stairs and walkways, starting at the TR (S5) and ending at the Skyscape (S6). Figure 4.18 shows subjects beginning one of the trials.

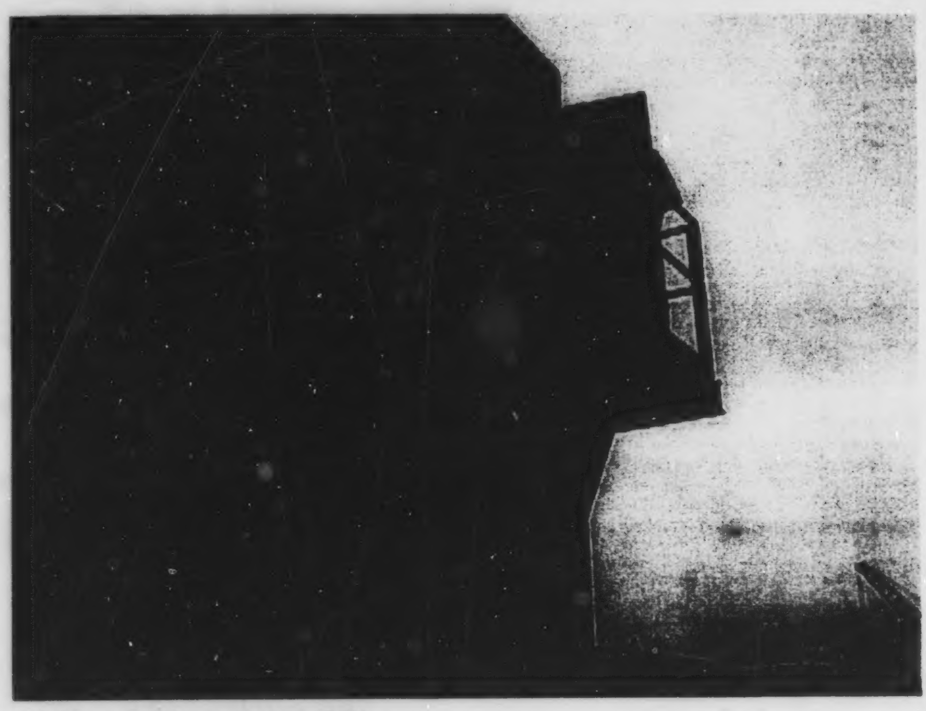


Figure 4.18 Subjects at start (TR)

4.3.3 Walkway (With and Without Hatch)

Walkway experiments, with and without a hatch, were carried out. A large hatch was used to assess delays caused by the hatch bottleneck effect. Three subjects participating in the walkway experiments are shown in Figure 4.19.

4.3.4 Lifeboat Entry

A series of trials was carried out to obtain data on the performance of subjects conducting a TEMPSC embarkation. Detail of a typical entry is shown in Figure 4.20.

Figure 4.19 Subjects during external walkway experiments

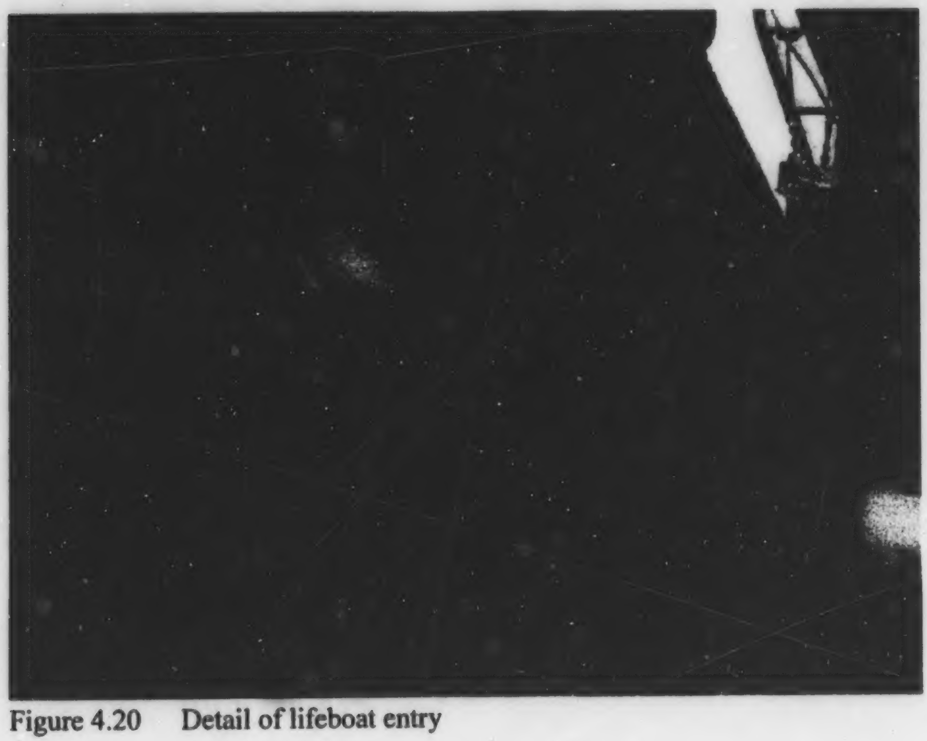


Figure 4.20 Detail of lifeboat entry

4.4 Analysis and Results

4.4.1 General Description

The following results are available from the experiments:

- Actual average times;
- Detailed analysis including intermediate times, delays, and other details;
- Summary results given in this section.

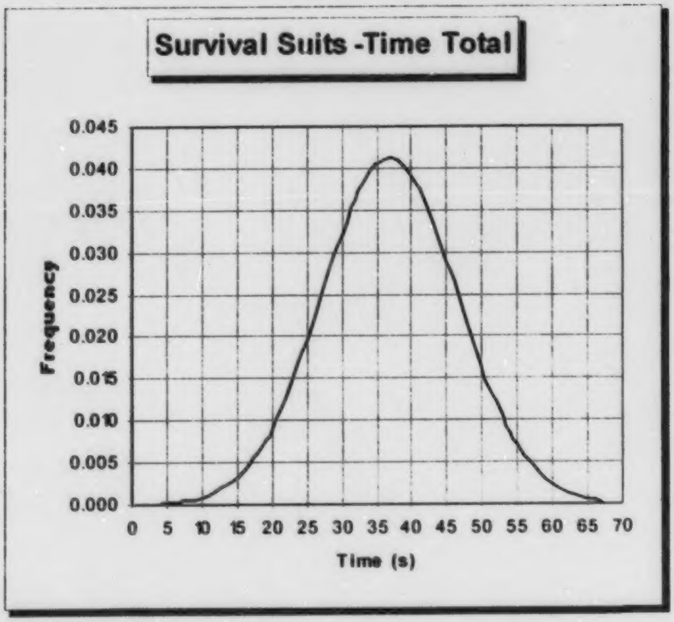
Summary results are based on standard statistical analyses for human performance data.

4.4.2 Survival Suit Experiment Results

Table 4.1 summarizes survival suit dressing times based on the performance of the 30 subjects during the November 2000 trials. The dressing times include taking the suit out of its bag and putting it on. Figure 4.21 shows the distribution plotted from the associated data, both as a frequency and a cumulative distribution function.

Table 4.1 Survival suit dressing times – individual *(30 subjects)*

Statistic	Time (s)
Mean	36.84
Standard Deviation	9.68
Maximum Time	74.23
Minimum Time	23.37
90% Time	49.25
10% Time	27.43



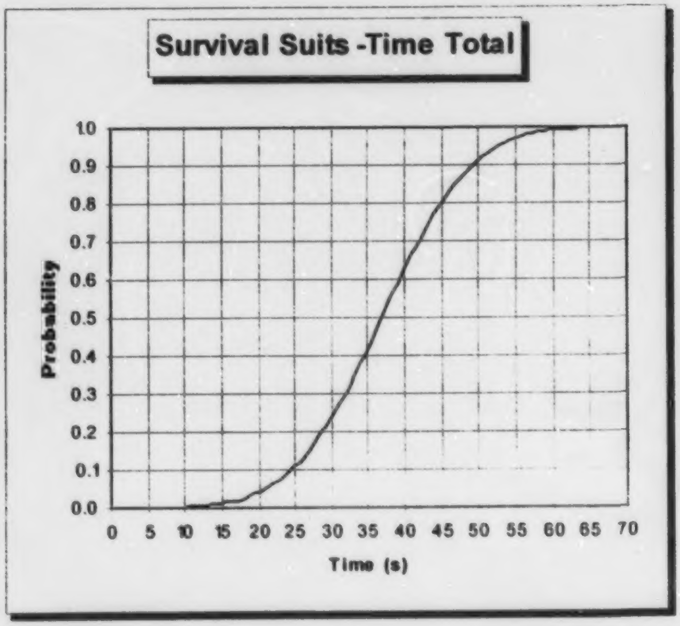


Figure 4.21 Survival suit dressing times – distributions (30 subjects)

4.4.3 Walkway Experiment Results

Internal walkways

Table 4.2 summarizes the human performance statistics for internal walkways, with and without suits. Group speeds given represent the average velocity between start by the first person and arrival of the last. The group individual statistics give the speed of an average individual in a group setting. The individual speeds give the speed of an individual without participation in a group. As these latter statistics were based on a significant sample, full statistics are given. These statistics are also given for performance with survival suits on, as well partial statistics for a situation where two groups come together as described in Section 4.1. Figure 4.22 shows the frequency and cumulative distributions for the individual speeds. These can be taken to represent performance both with and without survival suits for walkways as there is no significant difference between the two.

External winter

The winter experiments again only provide mean and maximum and minimum speeds, as only group timing data was available.

Table 4.2 Summary of walkway speed statistics (m/s)

Conditions			Group/Individual	Statistics					
				Mean	Standard Deviation	Max. Speed	Min. Speed	90% Speed	10% Speed
No Suits			Group	1.08	-	1.16	1.00	-	-
			Group Individual	1.87	-	2.13	1.71	-	-
			Individual	2.35	0.17	2.54	2.01	2.57	2.12
Suits On	Summer	Single Route	Group	1.06	-	1.10	1.03	-	-
			Group Individual	1.94	-	2.09	1.84	-	-
			Individual	2.22	0.19	2.44	1.96	2.46	1.98
		Confluence	Group	0.96	-	0.96	0.96	-	-
			Group Individual	1.51	-	1.53	1.48	-	-
	Winter		Group	1.04	-	1.06	1.01	-	-
			Group Individual	1.83	-	2.16	1.61	-	-

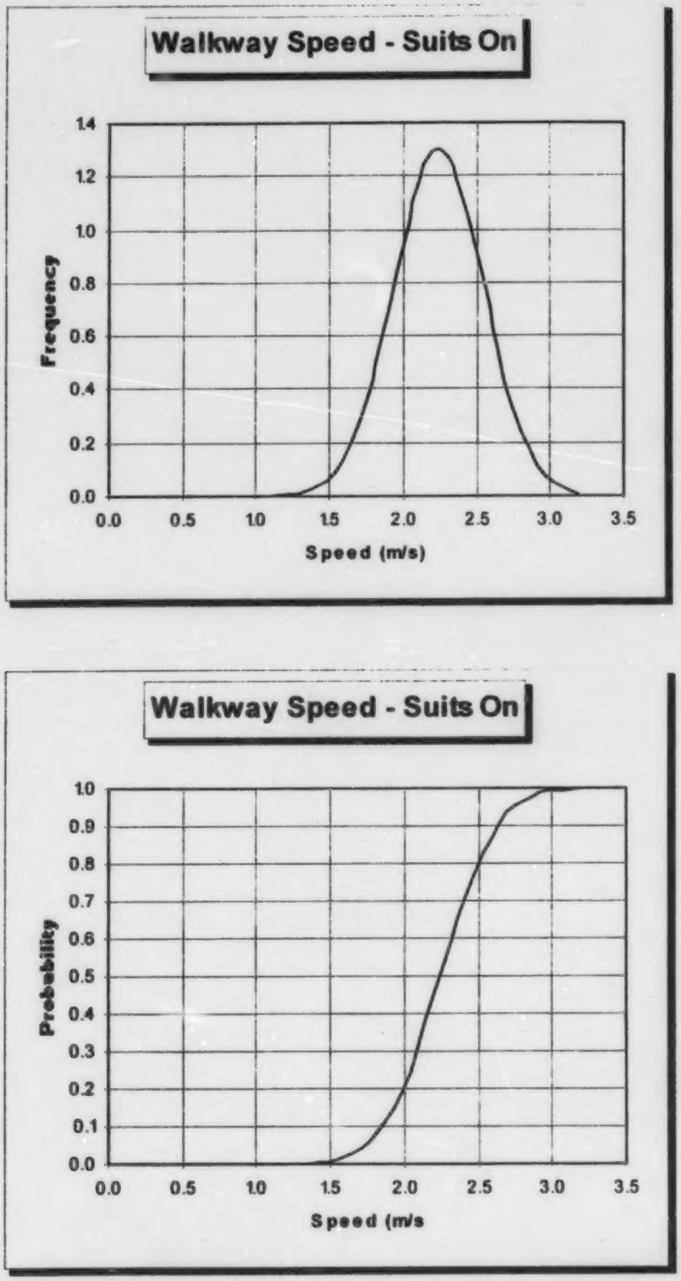


Figure 4.22 Walkway times – distributions

Bottleneck effects

Walkway experiments were carried out with and without hatches to pass through. Table 4.3 summarizes the hatch delay times.

Table 4.3 Bottleneck effects (s)

Conditions	Hatch Size	Delay (s)
Summer	Large	0.54
	Small	3.46
Winter	Large	0.89

Figure 4.23 Large hatch during internal walkway experiments

4.4.4 Stairs Experiment Results

External summer

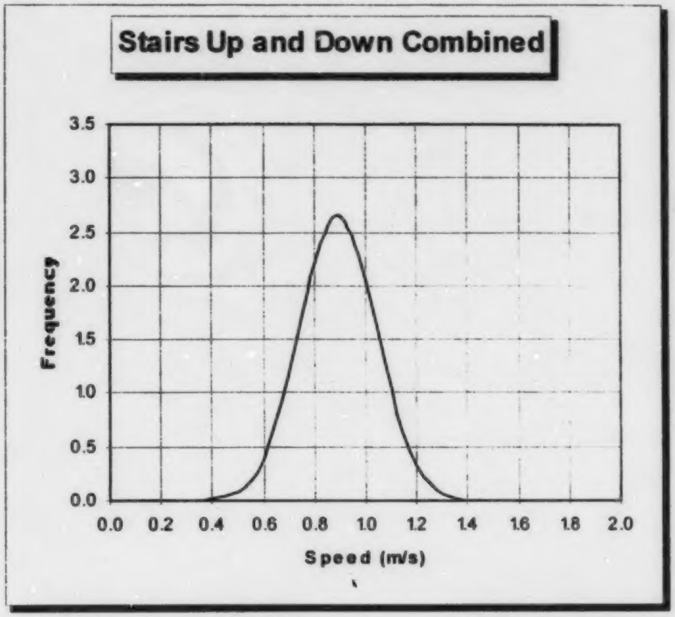
Table 4.3 summarizes the stair speed statistics for temperate conditions with and without suits. The same descriptions pertain to group, group individual, and individual statistics. Only individual times were taken for the summer condition with suits on. Figure 4.24 shows the frequency and cumulative distributions for the individual speeds.

External winter

Performance under winter conditions for the same sets of stairs corresponding to summer conditions are recorded and summarized in Table 4.3 for performance with survival suits on.

Table 4.4 Summary of stair speed statistics (m/s)

Parameters				Statistics					
				Mean	Standard Deviation	Max. Speed	Min. Speed	90% Speed	10% Speed
No Suits		Group	Up	0.46	-	0.52	0.39	-	-
			Down	0.42	-	0.48	0.33	-	-
		Group Individual	Up	1.22	-	0.65	0.80	-	-
			Down	0.94	-	1.15	0.63	-	-
Suits On	Summer	Group	Up	0.35	-	0.40	0.31	-	-
			Down	0.39	-	0.45	0.33	-	-
		Group Individual	Up	0.72	-	0.93	0.56	-	-
			Down	0.89	-	0.99	0.75	-	-
		Individual	Up	0.84	0.15	1.10	0.62	1.03	0.65
			Down	0.95	0.13	1.20	0.79	1.11	0.78
	Winter	Group	Up	0.45	-	0.45	0.45	-	-
			Down	0.54	-	0.57	0.51	-	-
		Group Individual	Up	1.07	-	1.46	0.78	-	-
			Down	1.26	-	1.41	1.09	-	-



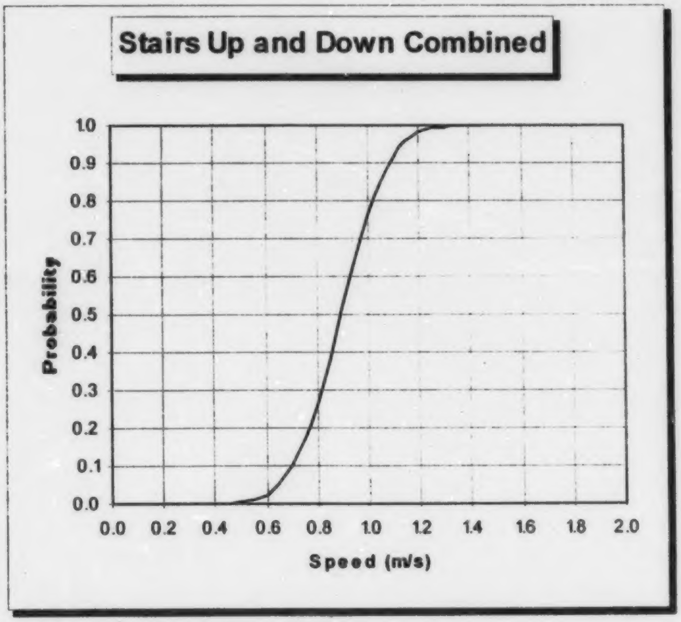


Figure 4.24 Stair times – distributions

4.4.5 Skyscape Experiment Results

The Skyscape experiments provided statistics on performance of two groups of 10, and one group of 30 on a 9-m vertical drop Skyscape. Table 4.4 summarizes the salient results of the experiments, including the group and group individual speed, the associated time to the bottom of the Skyscape, deployment of the daughter raft time interval, and the total time. In each case deployment of the Skyscape required an average of 15 seconds. It should be noted that the total time is not the sum of the daughter raft deployment time and the downtime, since the raft begins to be deployed by the first individual to get to the bottom of the Skyscape, while the rest of the subjects are descending. The time to transfer from mother raft to daughter raft is very small, between 2 and 3 seconds per individual. Thus, the time for the group to descend the Skyscape and the total time are generally relatively close, except for the first set of statistics.

Table 4.5 Skyscape experiments summary

Parameters			Speed (m/s)	Times (s)		
				Time Down	Raft Deploy	Total Time*
Group of 10	No Suits (4A)	Group	0.10	79.0	36.80	92.22
		Group Individual	0.31	-	-	-
	Suits On (4B)	Group	0.12	78.86	-	80.94
		Group Individual	0.32	-	-	-
Group of 30	Suits On	Group	0.05	172.31	52.0	173.2
		Group Individual	0.52	-	-	-

*Note: Total time all subjects in daughter raft.

5. EER APPLICATION: SOEP CASE STUDY

5.1 General Description of Project Information Requirements

The principal elements of information required for conducting the EER case study include the following:

- Facility gas compositions and segment volume, pipeline and reservoir flow rates;
- Associated facility operational parameters;
- Staffing profiles and their spatial and temporal distributions;
- Environmental conditions, specifically atmospheric conditions, winds, and sea state;
- EER and emergency response plan;
- Configuration of escape routes, evacuation equipment, and rescue systems including standby vessels and helicopter.

Table 5.1 summarizes the information required at the outset of the work. The present case study is based on the original Tier I SOEP configuration for which the authors of this report conducted a safety case [11, 12, 13, 14, 19, 50, 51], and which was provided by SOEP as an input to the current EER project. Changes are currently underway with Tier II of the project; however, results of its analysis are not in the public domain. Also, the application described herein is restricted to the main processing and accommodation platform (Thebaud) and is further restricted for the purposes of illustrative simplicity to one principal accident scenario.

5.2 Offshore Facilities

When fully developed, SOEP will include up to six production platforms and a permanent living quarters facility, generally as described in subsection 2.4.1. The central production complex at Thebaud will be continuously attended and include a drilling/wellhead platform bridge-linked to a production/utilities/quarters platform.

All satellite platforms will be tied back to the Thebaud platform via sub-sea interfield flowlines. A single sub-sea production gathering export pipeline will transport the gas/condensate from Thebaud to an onshore natural gas processing plant with related facilities in the Goldboro area and gathering pipelines from each of the satellite platforms.

The facility configuration was provided through a series of layouts, technical drawings, piping and instrumentation diagrams, and specific tabulated information such as the process volumes. Typical layouts for the Cellar Deck at the Thebaud Production platform are shown in plan view in Figure 5.1 and the platform elevation in Figure 5.2. As may be seen, the evacuation routes and emergency equipment are marked on the plan view in Figure 5.1. Similar plans were used for all levels.

Table 5.1 EER study data requirements

TASK	DATA
1. General	a) Facility layouts and specifications
	b) Meteorological and sea state data in probabilistic format
	c) Atmospheric visibility, temperature, ice fog, etc. data
	d) Results of previous smoke, gas dispersion, fire, explosion studies conducted for the facilities
	e) General emergency response philosophy of SOEP
2. Accident Effects	a) Isolatable sections, volumes, fluid compositions, production system and expected blowout parameters for each of three platforms. Emergency shutdown and blowdown. Drawings of systems specified
	b) Layouts and specifications of all structural/wall/safety systems and provisions for areas relevant to EER study
	c) Fire prevention/suppression/detection systems and procedures
	d) Fire Contingency Plan
3. Escape	a) Plan and section of all relevant areas with particular detail for escape routes, muster stations, embarkation points, and TSR (partially covered by 2b, above)
	b) Detailed plans of all worker populated areas including work areas, accommodation areas, muster stations, evacuation routes, TR, and embarkation areas
	c) Precise manning conditions and distributions in time and space, as well as equipment, clothing, normal complement of workers as well as any expected visitors, and roving maintenance team dwell times to be included in EER study
	d) Details of all safety equipment, including suits, lifejackets, and breathing apparatus for personnel safety, and details of safety equipment associated with TSR, including gas detectors, automatic shutoffs, emergency oxygen, and any other provisions
	e) Emergency procedures and escape plans

Table 5.1 EER study data requirements *(continued)*

TASK	DATA
4. Evacuation	a) Safety equipment locations, numbers, type, detailed configuration of embarkation areas, including any emergency equipment located in these areas, firewalls, blast shielding, and other safety features b) Expected personnel equipment, protective clothing, floatation devices, breathing apparatus c) Technical description and specifications of TEMPSC and Skyscape systems planned, together with detailed structural and mechanical drawings, if available d) Information on helicopters, including number, capacity, type, and response times as background for preferred evacuation method e) Any details available on alternative means of evacuation from platform including knotted ropes, abseil, life buoys, ropes, ladders, and equipment for wet evacuation support f) Evacuation procedures and plan
5. Rescue	a) Specification of known available FRC, standby vessels (including hoisting, and rescue equipment on vessel), helicopters, and any known other vessels in the area b) Distance area and location of possible safe (land equivalent) rescue points (such as Sable Island) and route characteristics under various ambient conditions thereto c) Any data available on known rescues in the area, for any sort of emergency situation, including helicopters down, and other accidents in recent history (some of these data will be available from Secunda Marine) d) Preferred and possible rescue plans and strategies

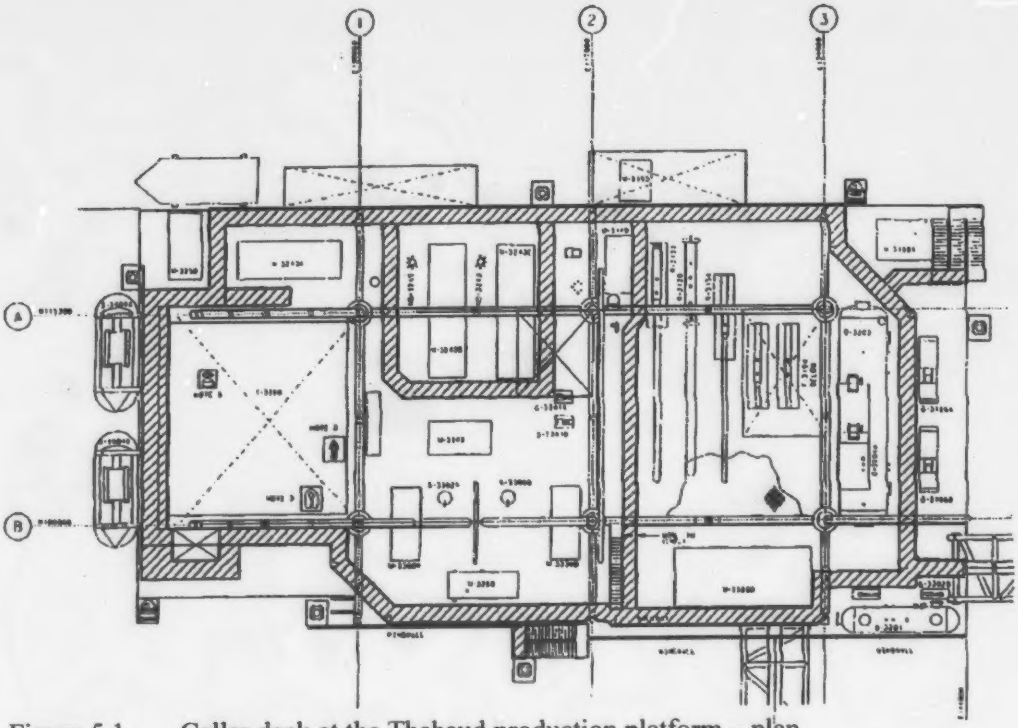


Figure 5.1 Cellar deck at the Thebaud production platform – plan

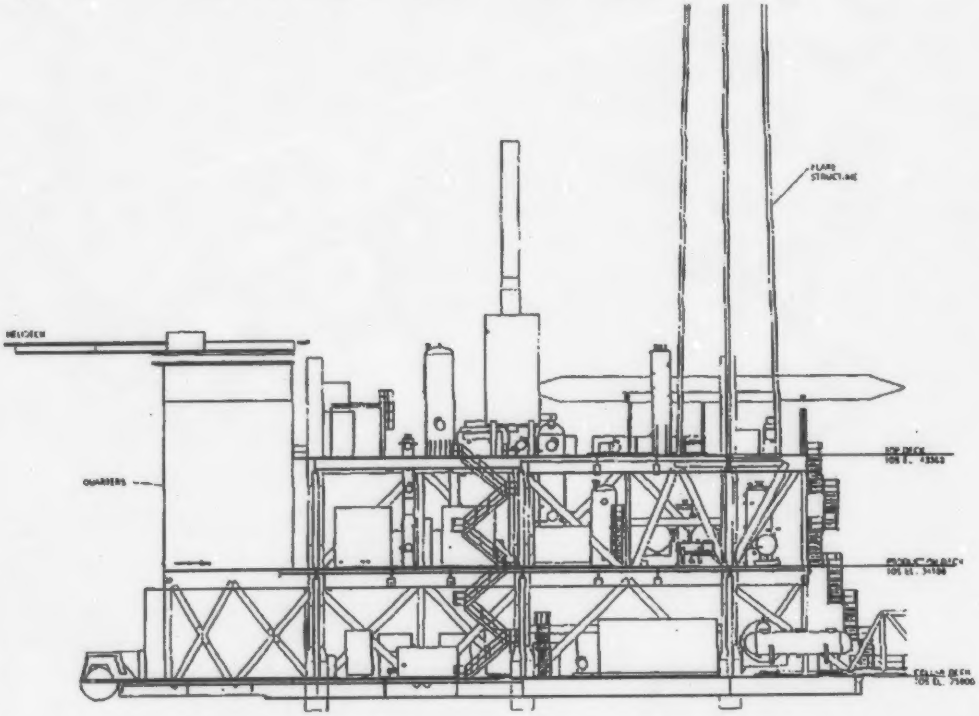

FLARE STRUCTURE
HELIDECK
QUARTERS
TOP DECK
CELLAR DECK

Figure 5.2 Thebaud production platform – elevation

5.3 Personnel Distributions and Safety Systems

The principal safety systems and operational parameters are the staffing distributions and the escape, evacuation, and rescue procedures.

Thebaud was analysed only for the maximum staffing profile that takes place during the hydraulic workover periods at the platform, giving a total of 40 at Thebaud. The general distribution of personnel for the platform considered herein is summarized in Table 5.2.

5.4 Environmental Parameters

The principal environmental parameters required for the study include sea state, wind, and atmospheric conditions. Figure 5.3 shows the annual wind statistics used for the SOEP offshore operational area [11, 12]. Table 5.3 describes the Beaufort wind force or number scale. The distribution of associated conditions for the SOEP area is given in Table 5.4.

5.5 EER Plan

5.5.1 Generic EER Procedure

The standard principal steps of any EER process may be summarized as follows:

Escape

1. Muster alarm activates
2. Personnel escape to TSR muster point
3. Personnel are accounted for at TSR muster point and situation is assessed
4. Order is given to evacuate
5. Personnel make their way to embarkation point

Evacuation

6. Personnel board craft
7. Craft prepared to launch
8. Lowering mechanism activated
9. Craft descends under control to near sea level
10. Craft descends final distance to sea level
11. Craft release gear activated
12. Craft moves away from platform

Rescue

13. Craft remains intact while awaiting pickup
14. Personnel recovered successfully from survival craft
15. Recovery unit returns to shore

Table 5.2 Staffing profiles – Thebaud

LOCATION	NORMAL # OF PERSONNEL	MAXIMUM # OF PERSONNEL
PRODUCTION PLATFORM		
Control Bldg.	1	2
Workshop	3	5
Quarters	3	7
Top Deck	2	2
Production Deck	3	7
Cellar Deck	2	6
Subcellar Deck		0
WELLHEAD PLATFORM		
Top Deck	1	11
Mez. Deck		
Cellar Deck		0
TOTAL	15	40

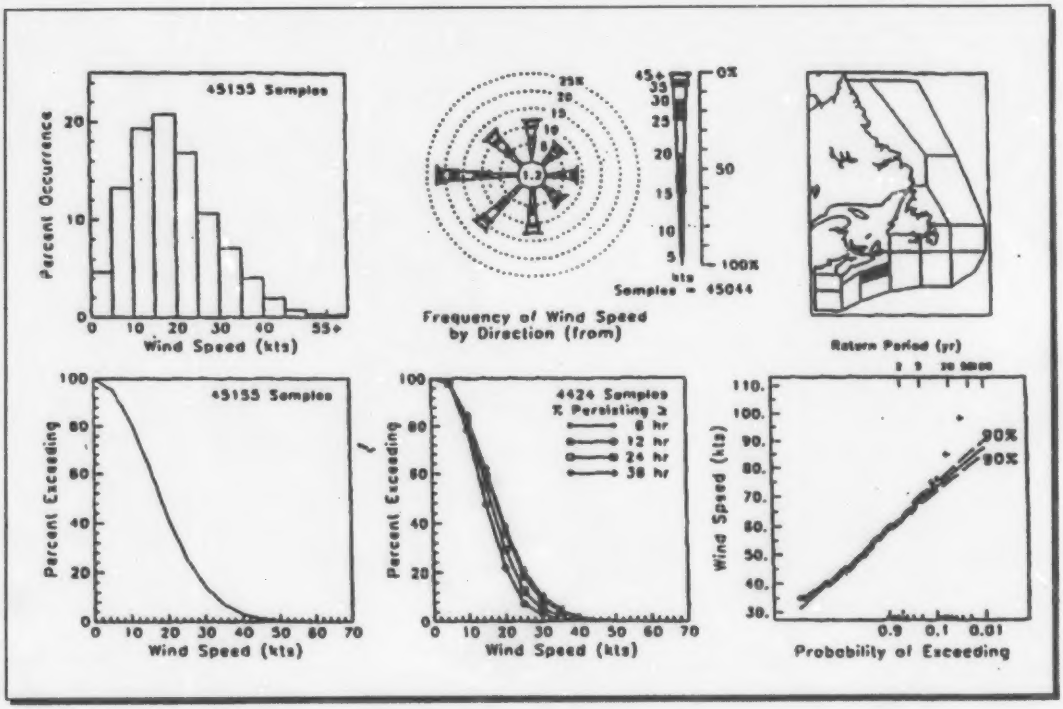


Figure 5.3 Sable region annual wind conditions

Table 5.3 Beaufort wind strength scale

BEAUFORT FORCE	WIND SPEED Knots (mph) [km/h]	DESCRIPTION
0	0-1 (< 1) [< 2]	**Calm**: Still. Smoke rises vertically. Sea is mirror smooth.
1	1-3 (1-3) [2-6]	**Light Air**: Rising smoke drifts, weather vane is inactive. Scale-like ripples on sea, no foam on wave crests.
2	4-6 (5-7) [7-11]	**Light Breeze**: Leaves rustle, can feel wind on your face, weather vane is active. Short wavelets, glassy wave crests.
3	7-10 (8-12) [13-19]	**Gentle Breeze**: Leaves and twigs move around. Lightweight flags extend. Long wavelets, glassy wave crests.
4	11-16 (13-18) [20-30]	**Moderate Breeze**: Thin branches move, dust and paper raised. Fairly frequent whitecaps.
5	17-21 (20-24) [31-39]	**Fresh Breeze**: Small trees sway. Moderate waves, many white foam crests.
6	22-27 (25-31) [41-50]	**Strong Breeze**: Large tree branches move, open wires begin to "whistle", umbrellas are difficult to control. Some spray on sea surface.
7	28-33 (32-38) [52-61]	**Moderate Gale**: Large trees begin to sway, noticeably difficult to walk. Foam from waves blown in streaks.
8	34-40 (39-46) [63-74]	**Fresh Gale**: Small branches broken from trees, walking in wind is very difficult. Long streaks of foam appear on waves.
9	41-47 (47-54) [76-87]	**Strong Gale**: Slight damage occurs to buildings, shingles are blown off roofs. High waves, crests start to roll over.
10	42-55 (55-63) [89-102]	**Whole Gale**: Large trees are uprooted, building damage is considerable. Sea takes on white appearance.
11	56-63 (64-72) [104-117]	**Storm**: Extensive widespread damage occurs. Exceptionally high waves, visibility affected.
12	64+ (>74) [>119]	**Hurricane**: Extreme destruction. Storm waves at sea. Air is filled with spray and foam.

Table 5.4 Weather conditions at SOEP

DESCRIPTION	Beaufort Force	Avg. Max Wind Velocity knots (km/h)	Percent Occurrence
Calm	0-4	16 (28)	37.5
Moderate	5-7	33 (61)	48.5
Severe	8-10	55 (102)	13.5
Extreme	11&12	64+ (118+)	0.5

In the present analysis, Steps 1 through 5 entail the escape process, Steps 6 to 12 constitute the evacuation process, and Steps 13 to 15 comprise the rescue process. The specific procedures and associated considerations described by SOEP personnel in regard to specific plans for each of the three platforms studied follow in the balance of this section.

5.5.2 Thebaud EER Procedure

The normal complement for Thebaud is 15 persons; during hydraulic workover operations, the total complement may be up to a maximum of 40 persons.

The following specific steps of the EER Process have been adopted for this installation:

1. The alarm sounds (in the case of fire or gas detection, or structural loss of integrity, the alarm is an emergency alarm).
2. Upon hearing an emergency alarm, all personnel make their work area safe and proceed to muster at the TR area.
3. An accounting of all personnel is made while the offshore installation manager (OIM) remains at the command centre in the control room, assessing the situation.
4. On the voice command of the OIM or the OIM's representative, evacuation is commenced.
5. All personnel proceed to the designated embarkation area. On the production platform, all personnel proceed preferably to the helicopter deck, if a helicopter is standing by and capable of evacuating them. If a helicopter is not available, they proceed to the TEMPSC embarkation point. Personnel on the wellhead platform, in the case of an accident at the production platform, proceed to the Skyscape embarkation point as their muster area. In the case of an accident at the wellhead platform, all personnel at the wellhead platform proceed across the bridge to the TR at the production platform and evacuate together with the balance of the personnel from the production platform. Clearly, a decision must be made by the OIM in regard to minor accidents on the production platform requiring evacuation; specifically, the

OIM must direct the wellhead platform personnel to either proceed to the production platform for a relatively safe evacuation by helicopter or TEMPSC, or standby at the wellhead platform in preparation for Skyscape evacuation.

Steps 6-12 are the steps in the EER that constitute the evacuation process itself. As indicated earlier, the preferred evacuation mode is by helicopter, the TEMPSC is next, and the Skyscape is used in the conditions described above.

Steps 13 and 14 constitute the rescue process. The rescue process essentially consists of surviving in the emergency craft and successfully transferring to a safe location such as the standby vessel, a rescue helicopter, or a land base with survival facilities. In the instance of personnel escaping from the wellhead platform directly through the Skyscape, an important element of the rescue is their transfer from the liferaft at the bottom of the Skyscape to a more mobile craft such as the FRC.

5.6 Application of RPT to Thebaud Platform EER Case Study

5.6.1 General Description of Method of Application

The Thebaud platform, under its initial design concept for Tier I of SOEP, was analysed with the preferred evacuation systems and emergency response plans in place as well as with possible hypothetical variations of these as described in Table 5.5. The preferred configuration of evacuation systems is referred to as Base Case 1.1 herein. The other cases consist of selected variations in the Emergency Response Plan and evacuation system configuration, and include cases 1.2 through 1.9. Essentially, the current version of the RPT, Version 3.3, was applied to assess the reliability and simulate the time of these different configurations. Both absolute results as well as relative results within the context of the Base Case are presented.

Table 5.5 Case study descriptions

Sensitivity	Case	Description
Base	1.1	Twin Davit TEMPSC + Skyscape
Evacuation	1.2	Twin Davit TEMPSC + Single Davit TEMPSC
	1.3	PROD + Skyscape
	1.4	Helicopter + Skyscape
	1.5	No helicopter – Twin Davit TEMPSC + Skyscape
Rescue	1.6	SAR helicopter max available
	1.7	No SAR helicopter
Abandonment Time	1.8	30 minute abandonment time limit
	1.9	60 minute abandonment time limit

5.6.2 Base Case 1.1

In Base Case 1.1, there are two principal evacuation systems: the TEMPSC located on the main accommodation platform as shown in Figure 5.2, and the Skyscape located on the wellhead platform, again as shown in Figure 5.2. In general, all personnel proceed to the TR and then to the TEMPSC. Only in the case where personnel are isolated on the wellhead platform (due to failure or impassability of the bridge) is the Skyscape used. In the RPT, the TEMPSC is the preferred evacuation mode, with a possibility allocated to selected personnel having to use the Skyscape.

5.6.3 Sensitivity Cases 1.2 to 1.9

Reasonable alternative configurations in the EER system are considered in the sensitivity studies. First, cases 1.2 through 1.5 consider alternative evacuation system configurations. Case 1.2 considers replacement of the Skyscape with a single point TEMPSC. Case 1.3 considers replacing the TEMPSCs with a PROD-assisted TEMPSC configuration and still using the Skyscape. Case 1.4 considers additional helicopter availability during all possible flying weather, replacing both TEMPSCs. Finally, case 1.5 removes any possibility of helicopter use and resorts to only the two emergency evacuation systems – the TEMPSCs and the Skyscape.

Cases 1.6 and 1.7 deal with alternative rescue mode availability. Case 1.6 considers SAR helicopters available at all possible flying weather times for the rescue. Case 1.7 considers no SAR helicopter availability. And finally, cases 1.8 and 1.9 consider alternative escape time restrictions. Such restrictions could be put into effect in the case of a structural failure of the jacket platform under consideration here. Case 1.8, specifically, considers a 30-minute abandonment time limit; that is, a 30-minute time limit to complete both the evacuation and escape steps. Case 1.9 considers the extension of this time limit to 60 minutes. The Base Case considers the abandonment time limit to be 90 minutes.

5.7 Analytical Results of Case Studies

5.7.1 Summary of Results

Table 5.6 gives a summary of the results of the sensitivity studies as well as the Base Case study. Both evacuation and EER rates are given for each case, together with the distribution for each for weather categories as well as the weighted average. The right-hand two columns give the increment and its positive or negative percentage increase relative to the Base Case. On inspection, it can be seen immediately that the highest increment sensitivity case 1.8 is the restriction of the 30-minute abandonment time limit, which results in a major, 30 percent reduction in EER success probability. Significant reductions in EER success probability are also evident for case 1.4, where the TEMPSCs are replaced by a helicopter, which has significant restrictions on weather capability, and case 1.5, where there are no helicopters available with their significantly high success rate for the calm and moderate weather conditions in which they are the preferred evacuation mode.

Table 5.6 Case study result summary

Sensitivity	Case	Description	Type	Weather				Weighted Average	Base Increment	
				Calm	Moderate	Severe	Extreme		Value	%
Base	**1.1**	**2 D. TEMPSC + SKYSCAPE**	**Evac.**	0.9999	0.9949	0.9266	0.1600	0.9796	0.0000	0.00
			EER	0.9924	0.8678	0.3862	0.0049	0.8439	0.0000	0.00
Evacuation	**1.2**	**2 D. TEMPSC + 1 D. TEMPSC**	**Evac.**	0.9999	0.9952	0.9327	0.1600	0.9805	0.0009	0.09
			EER	0.9925	0.8829	0.3976	0.0049	0.8526	0.0087	1.02
	1.3	**PROD + SKYSCAPE**	**Evac.**	0.9999	0.9949	0.9266	0.1600	0.9796	0.0000	0.00
			EER	0.9924	0.8678	0.3862	0.0049	0.8439	0.0000	0.00
	1.4	**HELICOPTER + SKYSCAPE**	**Evac.**	0.9998	0.9938	0.9056	0.1600	0.9763	-0.0033	-0.34
			EER	0.9922	0.8047	0.2613	0.0047	0.7973	-0.0466	-5.84
	1.5	**NO HELICOPTER - 2 D. TEMPSC + SKYSCAPE**	**Evac.**	0.9998	0.9923	0.9104	0.1600	0.9762	-0.0034	-0.35
			EER	0.9874	0.7750	0.2508	0.0049	0.7801	-0.0638	-8.18
Rescue	**1.6**	**SAR HELICOPTER MAX AVAILABLE**	**Evac.**	0.9999	0.9949	0.9266	0.1600	0.9796	0.0000	0.00
			EER	0.9924	0.8470	0.3457	0.0029	0.8287	-0.0152	-1.83
	1.7	**NO SAR HELICOPTER**	**Evac.**	0.9999	0.9949	0.9266	0.1600	0.9796	0.0000	0.00
			EER	0.9924	0.8945	0.3963	0.0051	0.8581	0.0142	1.65
Abandonment Time	**1.8**	**30-MINUTE ABANDONMENT TIME LIMIT**	**Evac.**	0.9999	0.9949	0.9266	0.1600	0.9796	0.0000	0.00
			EER	0.8443	0.6075	0.2703	0.0034	0.6476	-0.1963	-30.31
	1.9	**60-MINUTE ABANDONMENT TIME LIMIT**	**Evac.**	0.9999	0.9949	0.9266	0.1600	0.9796	0.0000	0.00
			EER	0.9924	0.8678	0.3862	0.0034	0.8439	0.0000	0.00

5.7.2 Base Case Results

Both the point value and Monte Carlo Base Case results are presented here. Figures 5.4 and 5.5 show, respectively, the Base Case evacuation success rate and integrated EER success rate, both for each of the four weather classes and as their weighted average. As may be seen, evacuation success is quite high for calm and moderate weather, but begins to decay for severe weather and drops dramatically for extreme weather. Nevertheless, the weighted evacuation success rate is relatively high, approximately 98 percent. When the rescue component is integrated into it (not to mention escape, which, as will be seen, has a high success rate for all conditions), a much greater weather sensitivity is manifested for both moderate and severe weather with the extreme weather likelihood of success being less than 1 percent. Weighted average also significantly drops below 98 percent to 84 percent when considering the total escape, evacuation, and rescue process. This does point out that even though evacuation success may be high, rescue can still considerably detract from the success rate, particularly when considering the more severe and extreme weather conditions.

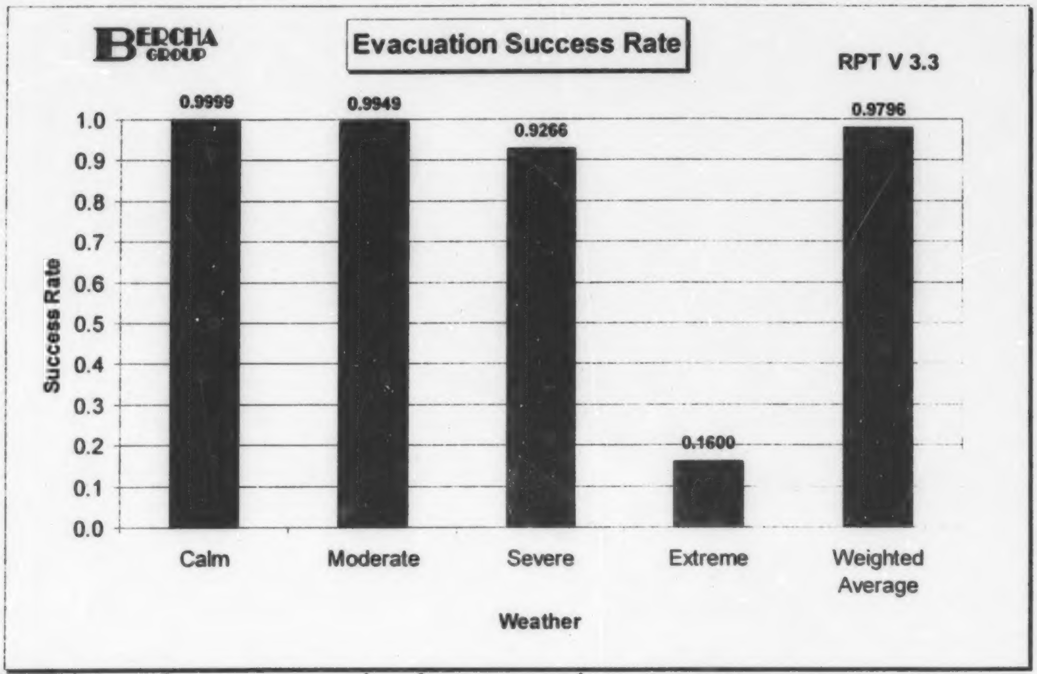


Figure 5.4 Base case evacuation chart – evacuation success rate

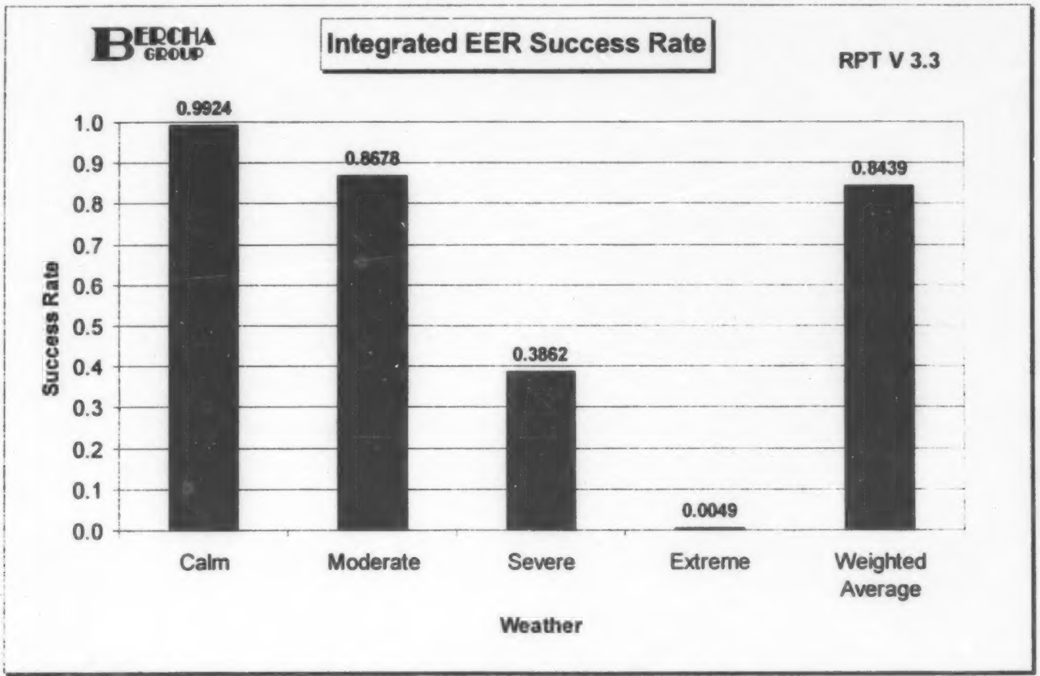


Figure 5.5 Base case EER chart – integrated EER success rate

Monte Carlo results for selected outputs are shown in Figures 5.6 through 5.9. Figure 5.6 shows the likely distribution of escape times and Figure 5.7 shows the associated probability of escape success. The escape time distribution has been indexed against the average SOEP escape time of approximately 13 minutes, with its variation within the 10 percent confidence limits. Probabilities of escape success are extremely high, with an expected value of 99.8 percent, illustrating that escape does not noticeably detract from the integrated EER success rate. Figure 5.8 shows the weather-weighted average for the evacuation success rate, which, as expected from Figure 5.4, has an expected value of approximately 98 percent. Next, Figure 5.9 shows the distribution for the integrated EER success rate, showing an expected value as shown in Figure 5.5 of approximately 84 percent. Both the point values and the Monte Carlo values show the importance of considering the entire EER system as a whole; that is, evacuation success rates averaged over all weather classes may be relatively high, while the integrated success rate, which is quite sensitive to the severe and extreme weather classes, can be significantly lower. It is in moderate weather where the rescue element comes into play most significantly, reducing the success rate from virtually 100 percent for the evacuation itself to less than 90 percent when the impact of rescue hazards is considered.

5.7.3 Sensitivity Evacuation Success Results

Figures 5.10, 5.11, 5.12, and 5.13 show the evacuation success rate results for calm, moderate, severe, and extreme weather, respectively. Note that the vertical scale is adjusted to emphasize the relative variation of the bars for each of the histograms. For calm and moderate weather, all evacuation success rates are above 99 percent, so that there is very little impact from altering the evacuation system configuration for these two good weather classes. Figures 5.12 and 5.13 show rather dramatic changes. In Figure 5.12, for the case of severe weather, there is a significant variance among the different cases, with case 1.2 (where the Skyscape is replaced by TEMPSC) showing an improvement over the Base Case, and case 1.4 (where the TEMPSCs are replaced with helicopters, which have very limited capability in severe weather) showing a significant decrease in expected success rates. Ironically, in case 1.5, where no helicopters are available, there is also a significant decrease in success rate (due to their high reliability in good weather).

The results for extreme weather – hurricane-type conditions – are uniformly dismal, showing a likelihood of evacuation success of only 16 percent for all cases.

5.7.4 Sensitivity Results for EER Success Rates

Figures 5.14 through 5.17 show the results of each of the sensitivity cases for the integrated EER success rates. Again, except for case 1.8 where there is an abandonment time limit (escape plus evacuation time), the results for calm weather are consistently high. As we move to moderate weather, there begins to be a significant spread among the EER success rates, with variations (except for case 1.8, which is off the scale) ranging from a low of approximately 77 percent for case 1.5 to a high of approximately 89 percent for case 1.7.

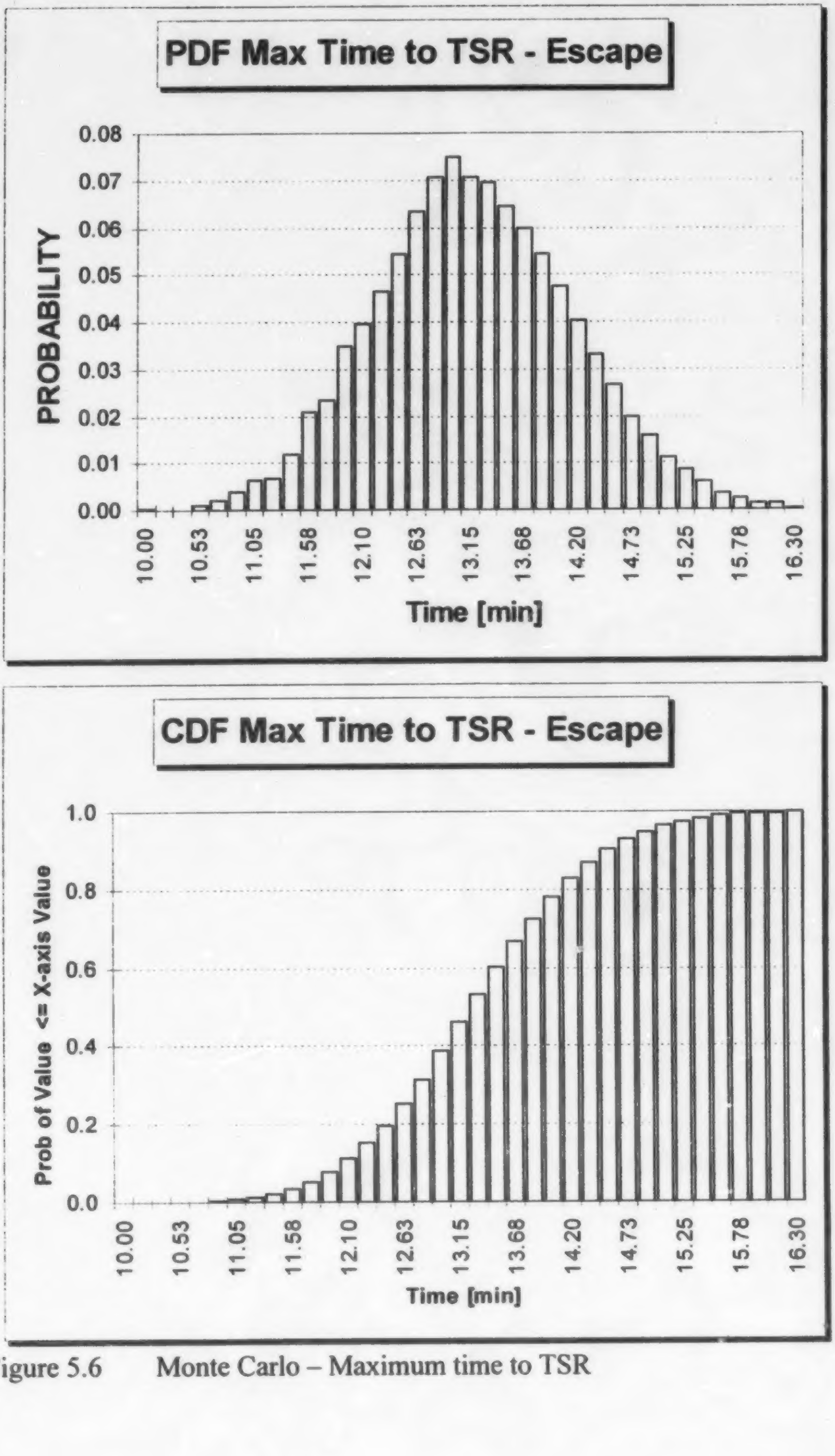
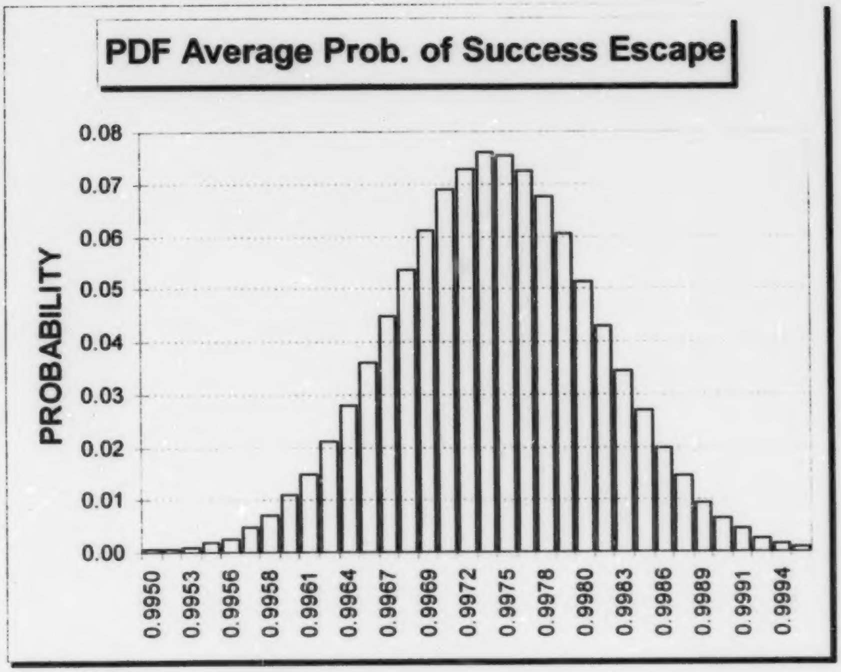


Figure 5.6 Monte Carlo – Maximum time to TSR



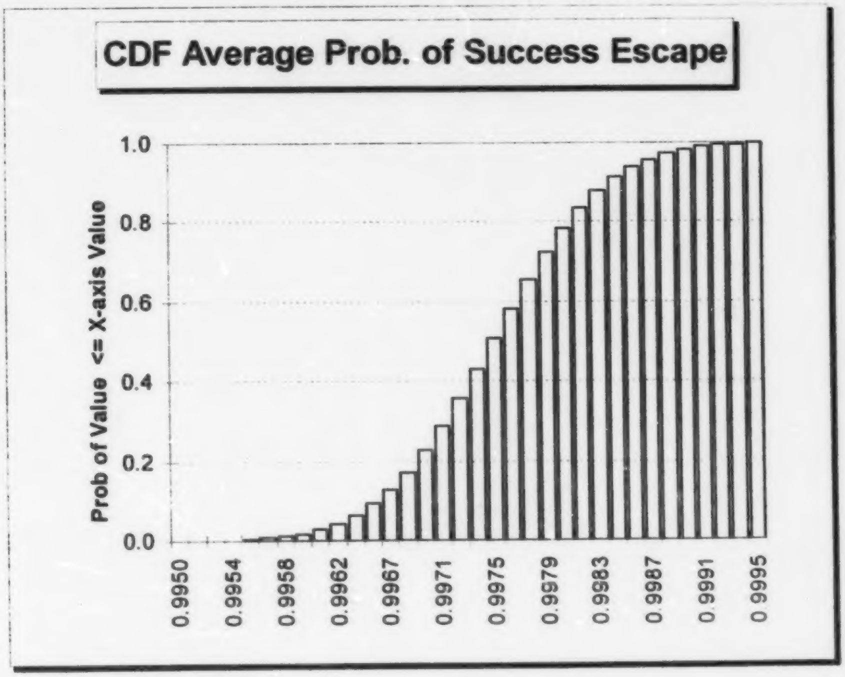
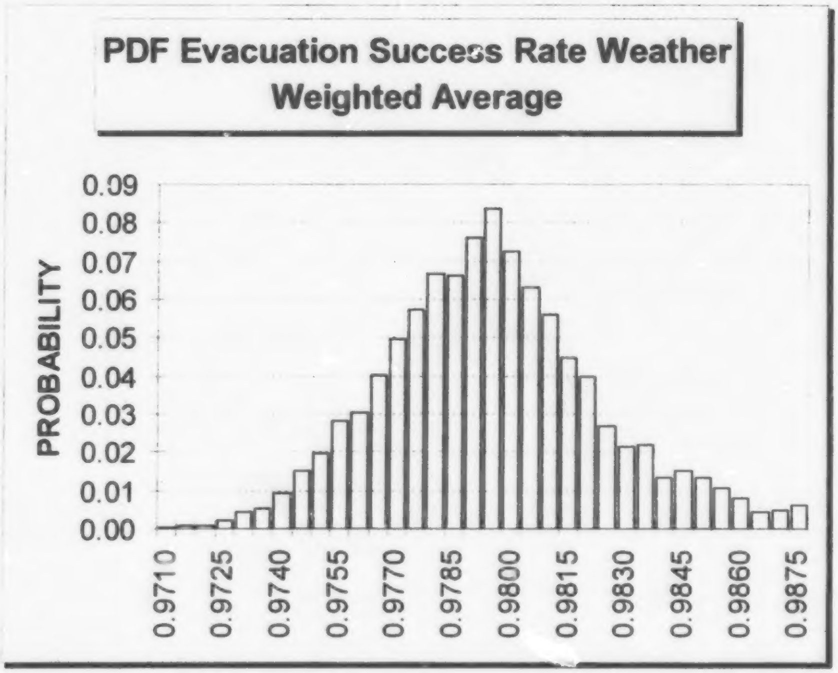


Figure 5.7 Monte Carlo – Average probability of success - escape



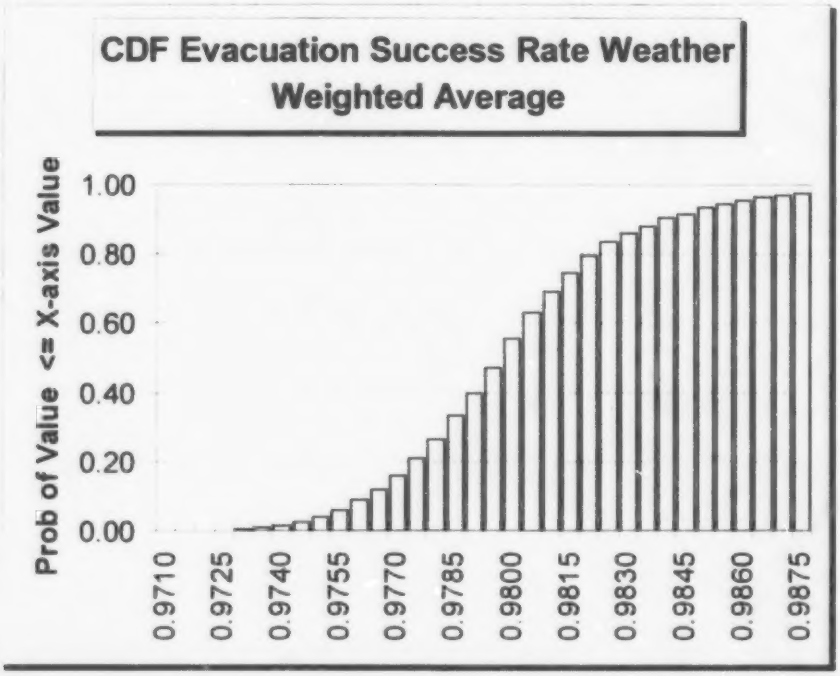


Figure 5.8 Monte Carlo – Evacuation success rate – weather-weighted average

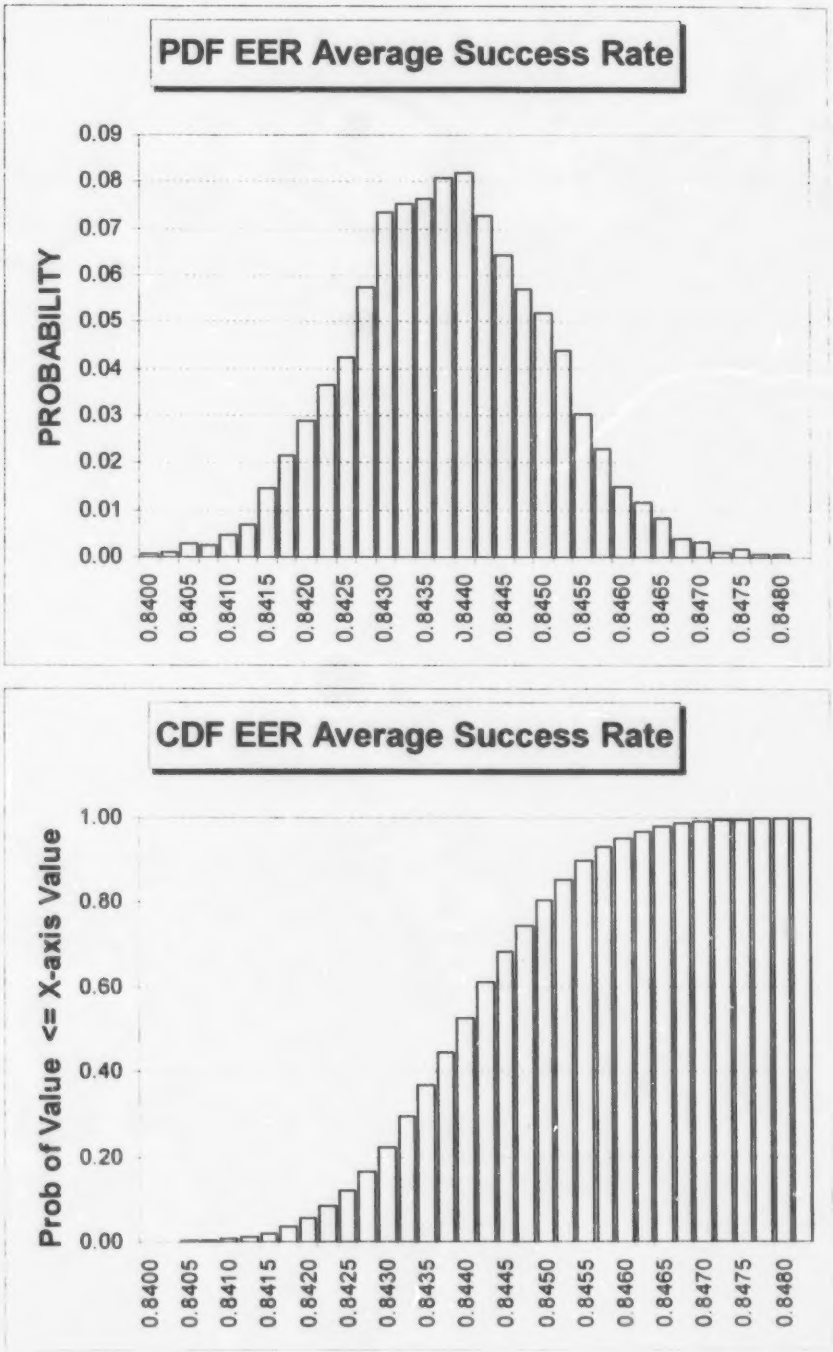
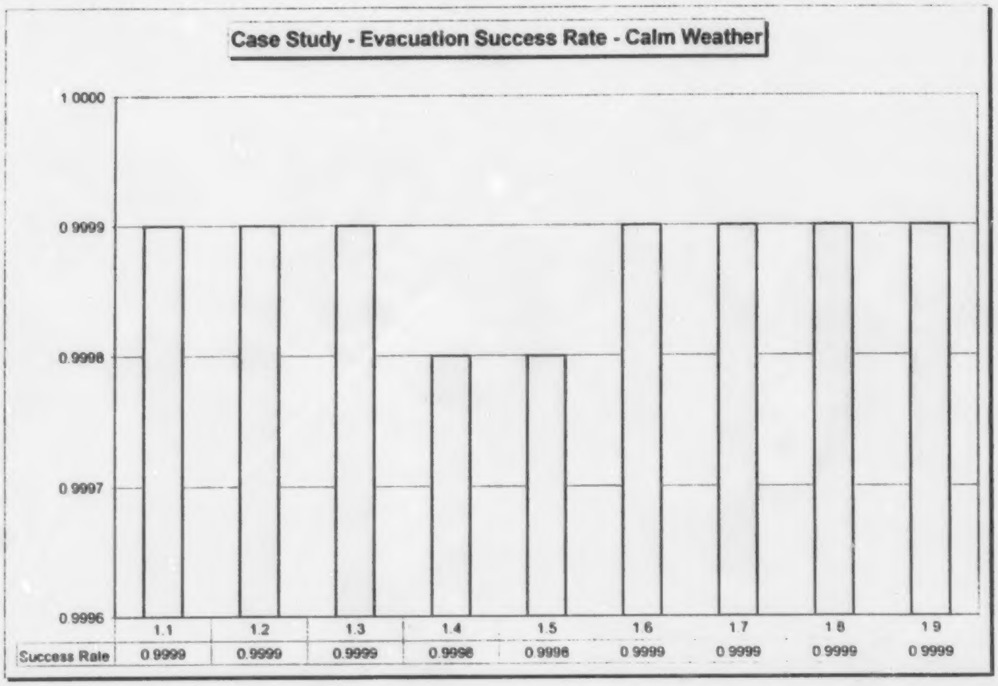
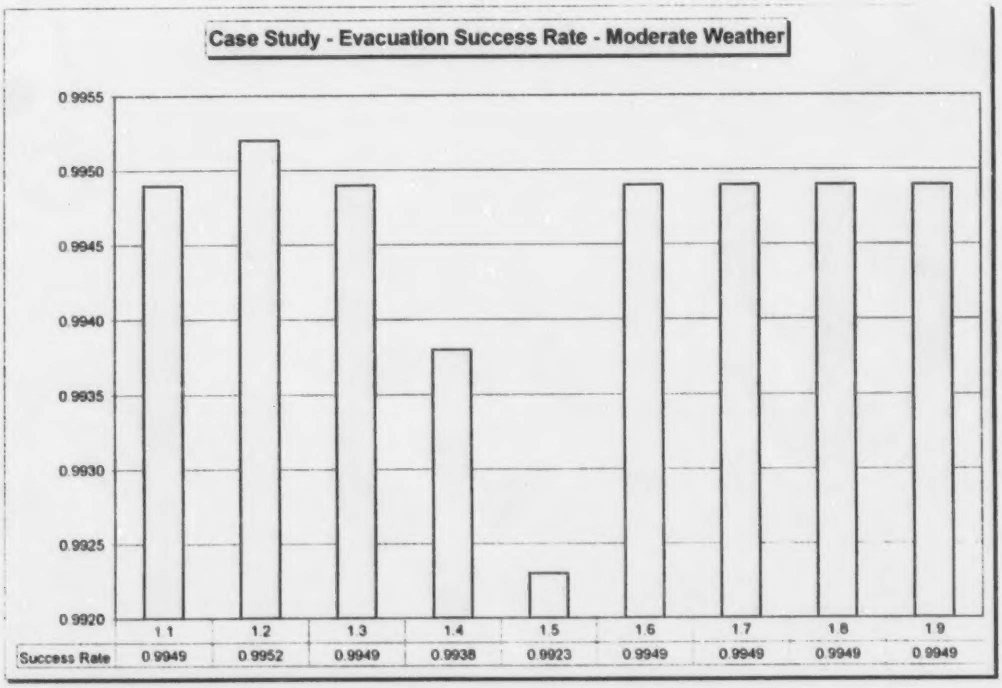


Figure 5.9 Monte Carlo – EER average success rate



	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9
Success Rate	0.9999	0.9999	0.9999	0.9998	0.9998	0.9999	0.9999	0.9999	0.9999

Figure 5.10 Sensitivity – evacuation success rate - calm weather



	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9
Success Rate	0.9949	0.9952	0.9949	0.9938	0.9923	0.9949	0.9949	0.9949	0.9949

Figure 5.11 Sensitivity – evacuation success rate - moderate weather

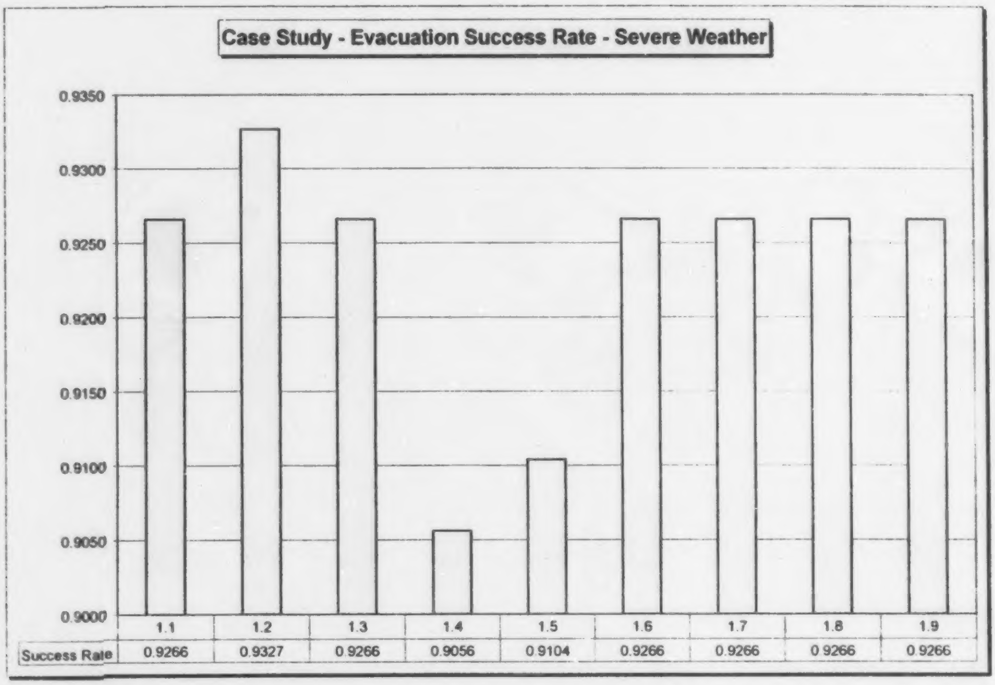


Figure 5.12 Sensitivity – evacuation success rate - severe weather

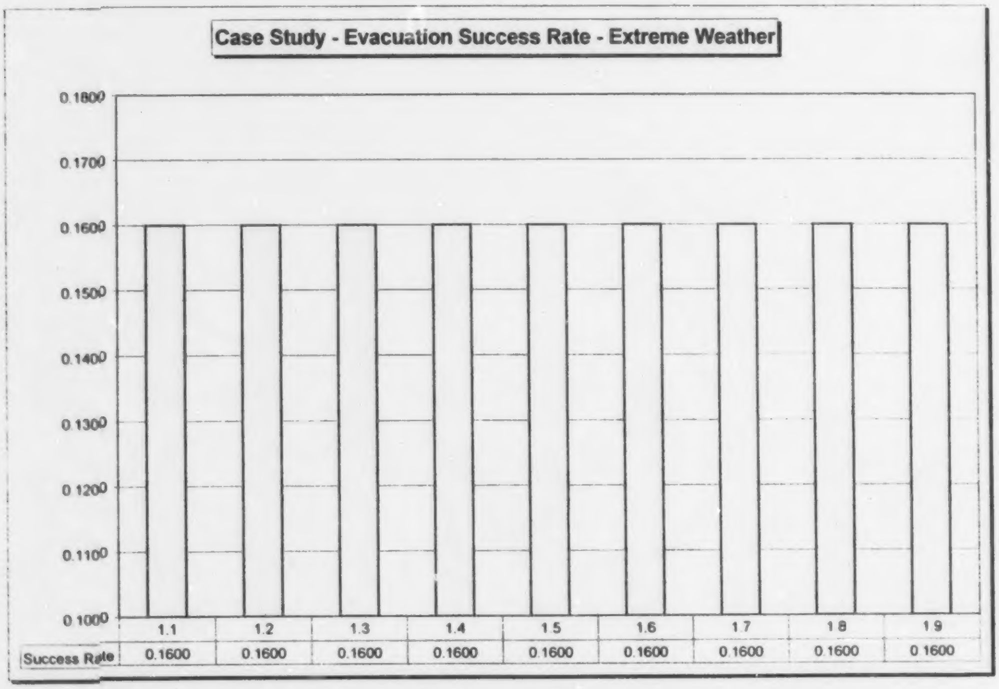


Figure 5.13 Sensitivity – evacuation success rate - extreme weather

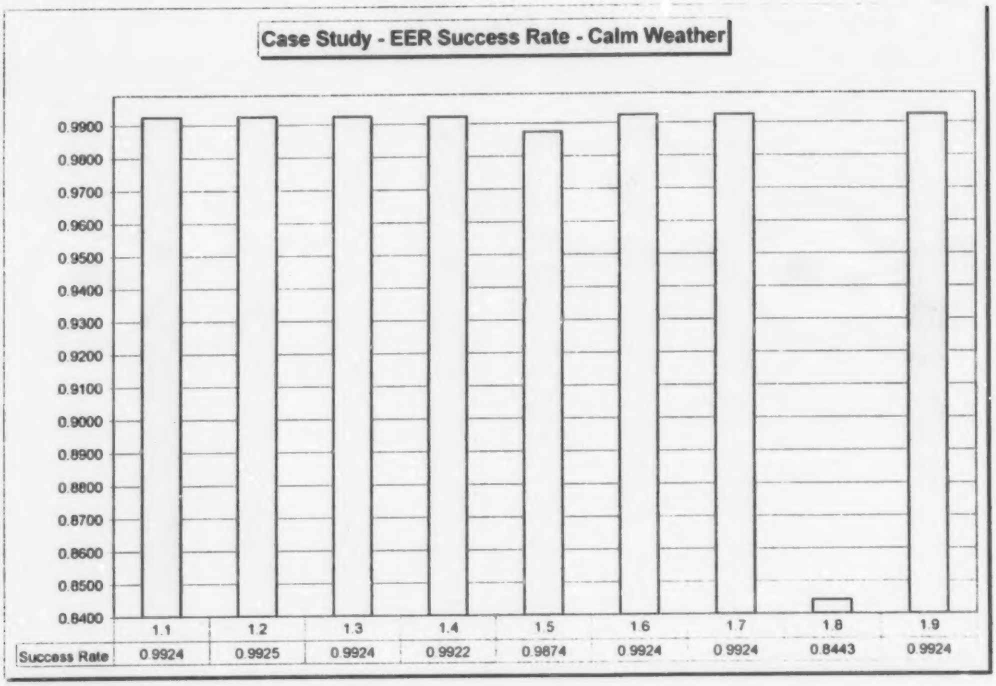


Figure 5.14 Sensitivity – EER success rate - calm weather

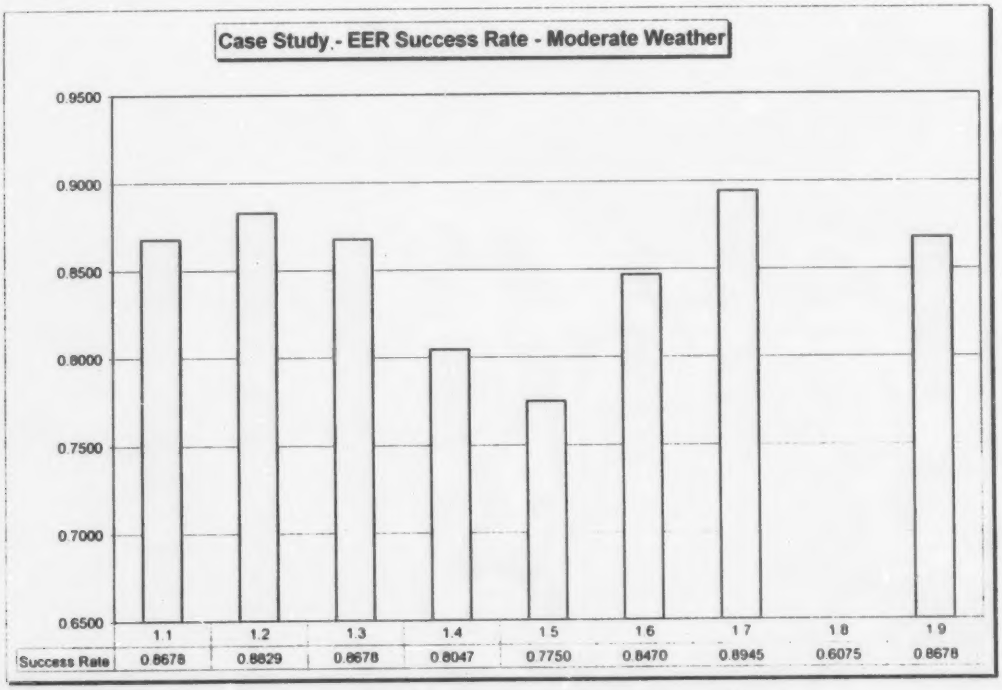


Figure 5.15 Sensitivity – EER success rate - moderate weather

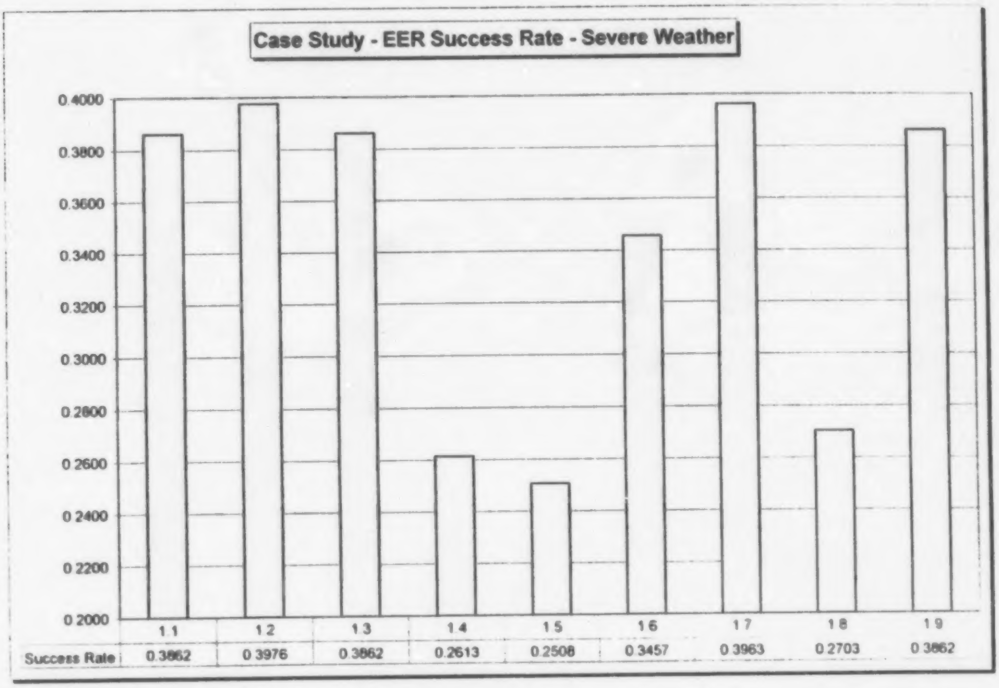


Figure 5.16 Sensitivity – EER success rate - severe weather

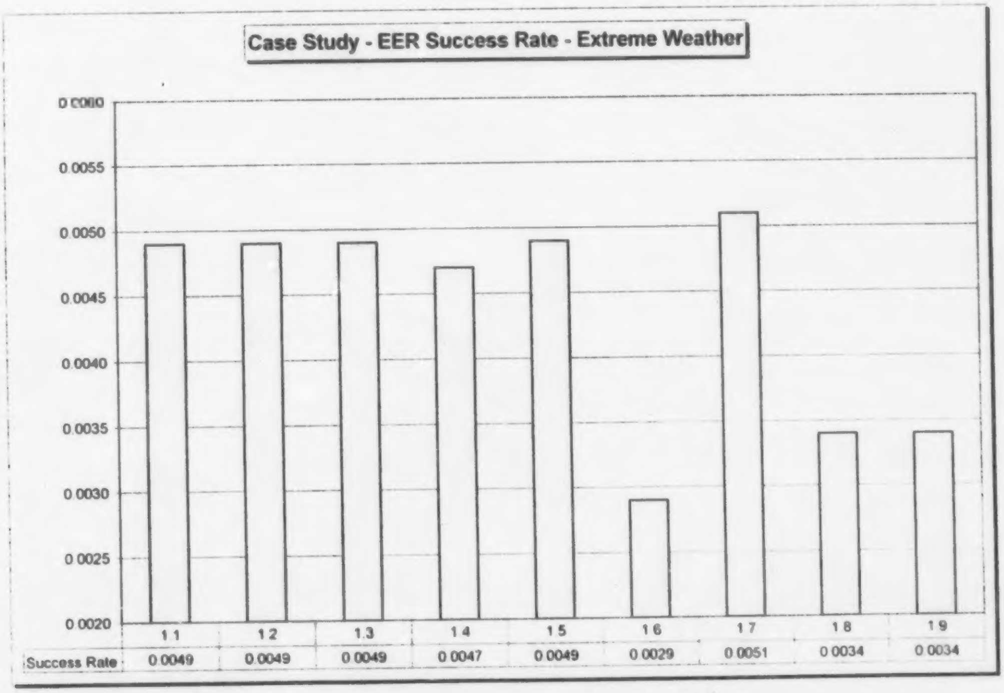


Figure 5.17 Sensitivity – EER success rate - extreme weather

For severe weather there is a consistent drop of all sensitivity results to below 40 percent, with a relative pattern similar to that for moderate weather. For extreme weather, all results are extremely low, below 1 percent.

The results relative to the Base Case for both the evacuation success rate (shown in Figure 5.18) and the EER success rate (shown in Figure 5.19) are instructive. As one might expect, replacement of the Skyscape in case 1.2 with a TEMPSC increases both evacuation and overall EER success rate. Cases 1.4 and 1.5 show a moderate decrease due to adjustment of helicopter availability. The most significant decrease, as pointed out in subsection 5.7.1, occurs when the abandonment time is highly restricted, as could be the case where a structural collapse or rapid sinking of a floating installation is underway.

5.8 Lessons from Sensitivity Studies

The sensitivity studies provide a variety of lessons that will be further discussed within the context of performance-based standards in Chapter 6. However, in addition to pointing out the obvious lessons in the description of the results above, they can be summarized as given in Table 5.7. The discussion in this table has been restricted to what are generally referred to in Chapter 6 as global standards. The first one relates to escape. As can be seen, escape success is quite high as long as alternative routes to the TSR from each location are available so that any route impairment by accident can be circumvented by alternate routes. All evacuation and EER cases give high success results for good weather and very bad results, less than 20 percent evacuation success and less than 1 percent integrated EER success, for extreme weather. Thus, the performance of the EER system in moderate and severe weather is significant and will be the primary area in which different EER system configurations can be differentiated by reliability. Generally, combinations of independent systems such as TEMPSCs and helicopters perform better than ones with interdependent systems such as the Skyscape, which requires relatively rapid rescue of the evacuees in rafts. A low availability of helicopters, combined with excessive reliance throughout all weather conditions on evacuation helicopters, decreases expected evacuation success. For low helicopter availability, the liability is associated with not having a highly reliable evacuation capability for calm and moderate weather; on the other hand, excessive dependence on helicopters largely eliminates evacuation capability in severe and extreme weather where helicopters are ineffectual. The most dramatic effect of all (Item 6) was seen to be associated with abandonment time limitation. If the amount of time available for escape and evacuation is limited by a progressive impairment of the platform, below a total of, say, 30 minutes, the likelihood of successful EER is greatly reduced. In general, then, use of the RPT clearly delineates the impacts on EER success and performance time for different EER configurations.

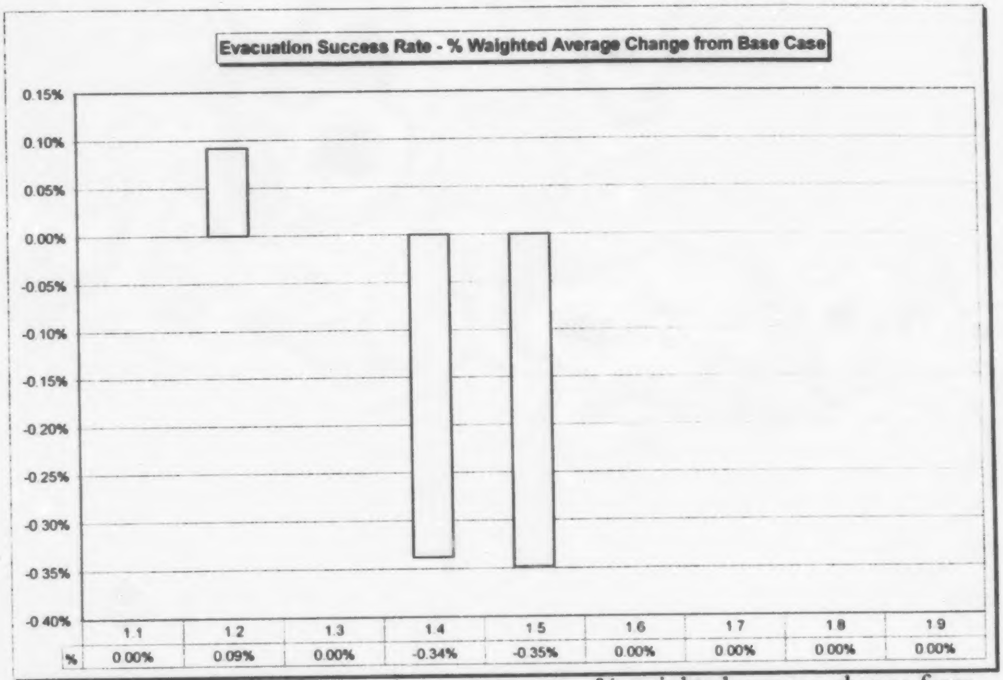


Figure 5.18 Case study – evacuation success rate - % weighted average change from base case

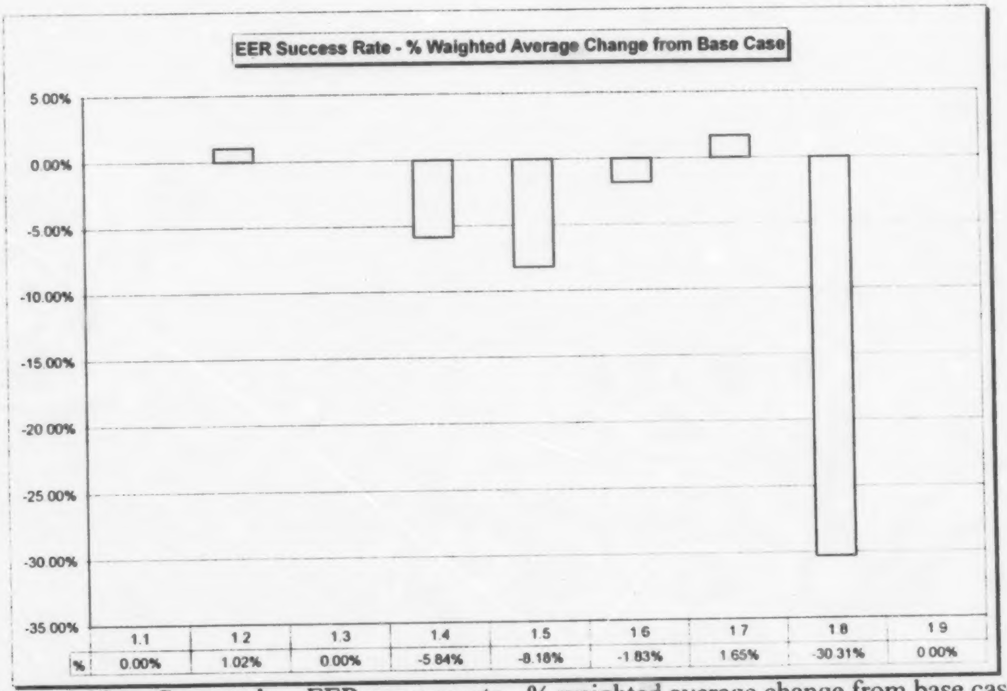


Figure 5.19 Case study – EER success rate - % weighted average change from base case

Table 5.7 Lessons from sensitivity studies

ITEM	RESULTS
1	Escape success is high, provided alternative routes to TSR from each location exist.
2	All cases are good for calm weather and very bad for extreme weather.
3	Performance in moderate and severe weather is what really counts.
4	Combinations of independent systems perform better than ones with interdependent systems.
5	Low helicopter availability decreases expected evacuation success, but total dependence on helicopters also reduces evacuation success due to their limited severe/extreme weather capability.
6	Abandonment (escape plus evacuation) time limit is very critical and all cases perform poorly for very short abandonment times.
7	RPT clearly shows sensitivity of EER success to different EER configurations.

6. DEVELOPMENT OF PERFORMANCE-BASED EER STANDARDS

6.1 General Description of Approaches to Performance-Based EER Standards

The functional approach to the development of performance-based EER standards within this project has evolved through the following steps:

- Worldwide review of data and literature
- Study, analysis, and modelling of the EER process
- Review of approaches to other jurisdictions with particular emphasis on the United Kingdom
- Stakeholder consultation
- Standards development

At the outset of the work, as described in Chapter 2 herein, a worldwide search of data and information on the general subject of EER, including all guidelines and standards available, was carried out. Although many regulatory standards were found [36, 58], most of these were prescriptive and therefore not truly performance-based. Only the safety case regime [53], adopted initially by the UK in the North Sea jurisdiction, and subsequently by Malaysia in its territorial waters and by the Newfoundland and Nova Scotia Petroleum Directorate, is a non-prescriptive regime, but relates primarily to risk. Recently, however, as described below, the development of performance-based evacuation standards have been initiated in the UK.

A detailed understanding of the generic EER process, its components and specific applications as well as its dependence on complement, weather, installation type, and other aspects of both modular and holistic EER process can be achieved through judicious and detailed computer simulation based on sound experiential and empirical data [15, 17, 18, 27, 28, 32, 33, 43, 55]. As described in Chapter 3, such a model has been developed under this contract and is capable of modelling all currently known aspects of the EER process – both in a simulation and a risk analysis mode. In addition, major uncertainties can be modelled with the RPT in a Monte Carlo mode. This permits, as illustrated in the case studies in Chapter 5, the identification of areas where performance-based standards can be developed and applied.

The UK HSE has initiated the development of performance-based standards, and Andrew Kingswood [4, 5, 37] has joined our project team to provide the advantage of their experience to date. Details of this are reported in Section 6.3.

Finally, as in all processes relating to public interest, stakeholder participation is essential. Through the Steering Committee under the direction of TDC, both industry and the East Coast petroleum directorates have had direct participation in the direction and management of the current program and it is intended that their participation be maintained and increased as the program moves towards the development of performance-based standards.

6.2 Lessons from RPT Application to Case Study

As described in Chapter 5, the case study based on the Pier I SOEP configuration for the main accommodation and processing platform, Thebaud, was carried out. The study consisted of the application of the RPT to a base case, one which was originally assessed for the safety case, as well as reasonable but hypothetical variations in the evacuation systems, rescue potential, and abandonment time. Table 6.1 summarizes some of the conclusions and results that were revealed from the case studies. It should be noted that only a few salient conclusions have been shown; many more can be developed from the case studies given. Taking these conclusions, in an informal way, to possible global or general performance standards is illustrated in Table 6.2.

6.3 UK Approaches to Performance-Based Evacuation Standards

The UK HSE has recently taken steps toward the development of verifiable performance standards applicable primarily to the evacuation component of the EER process. Assistance to the HSE was provided by A. Kingswood of ARK Safety [4, 5, 37], an offshore safety specialist located in the UK. To ensure the most efficient access to relevant developments in the UK under the present project, ARK Safety was incorporated into the Bercha Project Team for the EER research project. Specifically, reference is made to a recent publication from a safety conference in the UK [37] as well as two presentations made by ARK Safety to the Steering Committee for the present work [4, 5].

Verifiable performance standards applicable to evacuation remain an area of concern for the industry and have therefore been identified as an issue warranting further investigation. Focusing on the evacuation process, the HSE has endeavoured to provide proposed benchmark principles and values for evacuation systems, which are designed to reduce the risks associated with evacuation activities to as low as reasonably practicable (ALARP). The objectives of the work were set out as follows:

- To identify the type and scope of the evacuation process.
- To investigate and subdivide the process into principal operational steps or events for which associated performance standards could be considered for adoption.
- To propose suitable performance standards for identified operational steps.

Essentially, performance-based evacuation standards are intended to be verifiable performance standards that provide benchmark qualitative targets and quantitative values for evacuation system performance and are designed to reduce risks associated with evacuation to ALARP. The most important criteria for these evacuation standards is that they be verifiable by third parties, whether they are qualitative or quantitative.

Table 6.1 Lessons from sensitivity studies

ITEM	RESULTS
1	Escape success is high, provided alternative routes to TSR from each location exist.
2	All cases are good for calm weather and very bad for extreme weather.
3	Performance in moderate and severe weather is what really counts.
4	Combinations of independent systems perform better than ones with interdependent systems.
5	Low helicopter availability decreases expected evacuation success, but total dependence on helicopters also reduces evacuation success due to the limited severe/extreme weather capability.
6	Abandonment (escape plus evacuation) time limit is very critical and all cases perform poorly for very short abandonment times.
7	RPT clearly shows sensitivity of EER success to different EER configurations.

Table 6.2 Possible global standards from case/sensitivity study

STANDARD	DESCRIPTION
1	Alternative escape routes available for each personnel location for each accident scenario.
2	Total EER for calm weather exceeds 99.9% reliability.
2A	TR integrity (breathable air, fire resistance) for full complement in fire scenario equal to probable duration of extreme weather (e.g., 4 hours).
3	Minimum evacuation success rate for moderate and severe weather (e.g., M = 99%, S = 93%)
4	At least one independent evacuation system per installation
5	Helicopter available for evacuation minimum 50% of the time
5A	SBV available for rescue minimum 50% of the time
6	Successful (98%) abandonment (escape + evacuation) <30 min. for all except extreme weather.

Performance standards can be in the form of a statement that is expressed in qualitative terms for the performance required of the system, equipment, persons, or procedures. These are commonly addressed by considering the following four main issues:

- Functionality - What must the item/system achieve to fulfil the required goal?
- Reliability/Availability - Is it ready to function and how often will it function adequately?
- Survivability - Will it continue to function when required under all operational conditions?
- Interaction/Dependability - Is it required to interact with other systems for overall objectives to be met?

Performance standards can be applied at various levels for an operational system. In regard to evacuation, a time frame is important (as discussed under case studies regarding abandonment) in as much as evacuation should be achieved in a given time from initiation of the process to personnel being in a place of safety such as a TEMPSC. The evacuation and clearance of the installation is intimately dependent on the time of performance and therefore warrants a time-based performance standard. However, transfer and recovery to a place of safety, although still time critical, does not require such detailed time consideration, but rather requires a reliable and effective process. Thus, as stated earlier, the evacuation process itself must be broken down into steps, some of which are time critical, while others are primarily reliability critical.

In general, performance standards under consideration by the HSE may be subdivided into the following two levels:

- General performance objectives that will be applied to all evacuation systems.
- Specific operational standards that give detailed performance objectives for installation-based evacuation systems and in-field evacuation systems such as Gemevac.

General performance standards based on [4] are given in Table 6.3. As can be seen, these are largely qualitative and are subdivided into the standard or criterion itself and the associated objective. These standards are generally self-explanatory as are the objectives. Specific performance standards under consideration by the HSE are summarized in Table 6.4. These specific standards have been subdivided by subject, which indicates the specific area addressed, and the standard itself, which generally gives a quantitative guideline to be used in the designated subject or process. Again, these standards are self-explanatory.

In general, the standards under consideration by the HSE are at the initial stage of development and are restricted to the evacuation process itself. The EER system, particularly for some of the more severe weather conditions, should be regarded in an integrated fashion, and sets of standards that are applicable globally, by component, and by activity or equipment item should be developed for the entire process.

Table 6.3 UK general performance standards

STANDARD	OBJECTIVE
Simple to operate	• Minimal manual operations, decisions, crew, and special training
Mobilization time – personnel	• Minimum time and crew
Clearing immediate vicinity	• Minimum time – individual or group evacuation
Hardware locations	• Minimum hardware locations, and minimum hardware located off installation
Simple design	• Minimum operational decisions, parts, and complexity
Degree of backup	• Automated systems
System autonomy and powering	• Independent – use of gravity or stored power • Automated systems – emergency power-generating systems
Integrated design	• One system – one design – one functional responsibility
Operational performance	• Proven and tested under specified conditions – environmental and emergency • Operational in Beaufort 6 + 3 m waves
Strength	• Structures F of S = 4.5 –1, Rigging 6 – 1 • Reductions if loading clearly established
Personnel protection	• From all identified environmental and emergency conditions (e.g., weather, sea, fire, and gas)
Reliable	• Established means of testing and established inspection and maintenance requirements

Table 6.4 UK specific performance standards

SUBJECT	STANDARD
Preparation	
• Time	• 5 minutes max.
• Persons required	• 1
Embarkation	
• Time	• 3 minutes max.
• Access	• 2 persons at once
• Seating	• ARS
• Stretcher	• 1
• Communications	• 2 VHF
Launch-Lower	
• Initiation	• Within
• Speed (wire lowered)	• Wire lower 1 m/sec max.
• Motion control (wire lowered)	• Additional control
• Protection	• ARS
• Attitude of installation	• 15° fixed, 20° floating
• Clearance	• 15° cone + 3 m fixed • 20° cone + 3 m floating
• Water entry	• Escape direction
Water Contact – Release – Escape	
• Release (if required)	• Automatic – safeguards
• Thrust	• Instant thrust (e.g., 500 kgF for 5 sec) • Acceleration 0-6 knots in 5 sec
• Time to launch and clear	• 45 second initiation to 25 m clear

Table 6.4 UK specific performance standards

SUBJECT	STANDARD
Open Water	
• Personnel Protection • Seating • Environment • Impact protection • Freeboard • Stability • Survival equipment • Provisioning • Access and escape	• As Required by Standards (ARS)
• Seakindliness	• Headway into Beaufort 6 plus 3 m waves without excessive slamming and motions
• Oil fire and gas protection	• 8 minutes fire, 10 minutes air
• Escape functions	• Minimum hatches while provisioning escape potential
• Propulsion and steering	• Diesel powered – systems proven in anticipated operational conditions • 6 knots calm water
• Speed – performance – towing	• Positive headway into Beaufort 6 plus 3 m waves • Tow 25-man liferaft 2 knots in Beaufort 6 plus 3 m waves • Be towed at 10 knots calm water • Be towed 6 knots Beaufort 6 plus 3 m waves • 12 hours at full power
Open Water – MOB	
• ID casualty	• Helmsman's view
• Manoeuvrability – station keeping	• Demo. Beaufort 6
• Casualty recovery – location	• Demo. Beaufort 6 • Clear view for helmsman • Craft not jeopardized
• Protection for casualty	• Propulsion – steering systems
Rescue and/or Recovery	
• Identification – tracking	• EPIRBs – radar reflector
• Conditions	Demonstrated in specified conditions (minimum Beaufort 6 plus 3 m waves
• Special provisions	• Identified and demonstrated in Beaufort 6
• Hydrostatic – freeboard – access	• Demonstrated in Beaufort 6
• Manoeuvrability – station keeping	• Demonstrated in Beaufort 6
• Impact – induced motion – transfer	• Protection to ARS
• Escape routes	• Provided
• Helicopter transfer	• Without entering sea

6.4 Performance Standard Categories

Based on the literature review, case studies, and review of UK approaches, as well as discussions with stakeholders through the Steering Committee, a categorization of performance-based standards for escape, evacuation, and rescue has been developed. This categorization is schematically illustrated in Figure 6.1. As can be seen, there are two broad categories of performance standards: global and specific.

Global standards pertain to the installation and operation as a whole. They are, however, applicable to both the entire EER process and each of its principal components – escape, evacuation, and rescue. They are not, however, descriptive, either qualitatively or quantitatively, of any specific piece of equipment or operation; rather, they are general in nature. Global EER standards include areas such as risk optimization through ALARP, reliability, availability, function, and cost benefit. The latter area of cost benefit is introduced because any successful standard must be affordable to the operator so that its use will be widespread. Standards under each of the specific components relate to the performance areas vital to permit its optimization. Thus, for example, as noted in Figure 6.1, the escape process is intimately dependent on having alternate routes so that accident effects can be avoided, adequate TR integrity, and a time sufficiently short to permit clearing the installation in time to be clear of its collapse in a worst case scenario. Evacuation global parameters would include such items as an optimal mix of autonomous (e.g., TEMPSC) and interdependent (e.g., Gemevac) evacuation systems, the ability to evacuate in a sufficiently short time to allow the abandonment (escape plus evacuation) time to be within worst case scenario limits, and an all-weather capability appropriate to the mix of weather conditions expected for the installation. Global rescue parameters include compatibility of evacuation modes with rescue modes, rescue mode availability, and again, all-weather rescue capability or at least contingency plans.

The specific standards are much more focused and there will be one set of specific standards for each EER system component and mode, as well as for the total EER system for a specific installation. As an example, for the case study described in Chapter 5, there would need to be a set of specific standards for the escape, two sets of standards for evacuation – with one for the TEMPSCs and one for the Skyscape – and numerous sets of standards for all the different rescue mode-evacuation mode combinations. Various specific standards are illustrated by those under consideration by the UK HSE as summarized in Table 6.4.

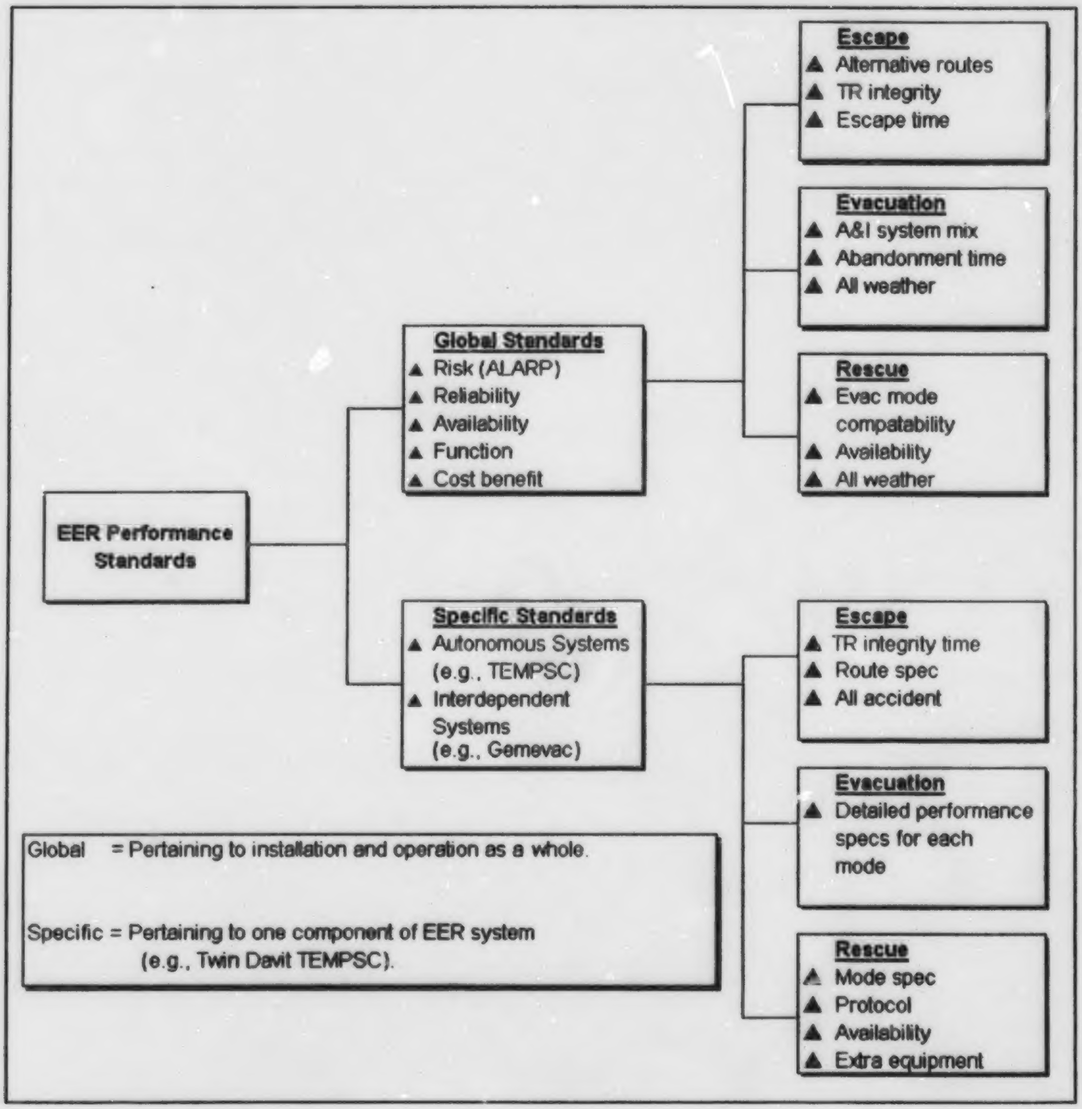

EER Performance Standards
Global Standards
▲ Risk (ALARP)
▲ Reliability
▲ Availability
▲ Function
▲ Cost benefit
Specific Standards
▲ Autonomous Systems (e.g., TEMPSC)
▲ Interdependent Systems (e.g., Gemevac)
Escape
▲ Alternative routes
▲ TR integrity
▲ Escape time
Evacuation
▲ A&I system mix
▲ Abandonment time
▲ All weather
Rescue
▲ Evac mode compatability
▲ Availability
▲ All weather
Escape
▲ TR integrity time
▲ Route spec
▲ All accident
Evacuation
▲ Detailed performance specs for each mode
Rescue
▲ Mode spec
▲ Protocol
▲ Availability
▲ Extra equipment
Global = Pertaining to installation and operation as a whole.
Specific = Pertaining to one component of EER system (e.g., Twin Davit TEMPSC).

Figure 6.1 Performance standard categories

6.5 Process for Development of Performance-Based Standards

The three-year program for the development of optimal performance-based standards for Canadian East Coast installations is described in this section. To date, the first year of the program has been completed as summarized in the current report. Year 1 consists of the work generally reported in this report and summarized in Table 6.5. Future work proposed for the next two years will be directed at the focused development of the quantitative and qualitative standards themselves. Figure 6.2 schematically depicts the process for the development of these standards and Table 6.6 summarizes them. Essentially, the work will consist of drafting the standards, consulting with stakeholders, identifying additional data and information needs, filling these information needs, and drafting the standards further. Following Year 3, the standards will be drafted in the form of specifications and reviewed by the authorities having jurisdiction as well as industry. Finally, the standards will be promulgated by the appropriate authorities. Table 6.6 also summarizes these steps for Years 2 and 3.

Of vital importance throughout the process is the element of stakeholder consultation and input. The standards must be workable both from the point of view of authorities and from that of the industrial users. Thus, it is essential that an integrated task force of all stakeholders be struck at the outset of Year 2 to facilitate this consultation process throughout the work.

Table 6.5 Steps to now

YEAR 1
▪ Literature and data
▪ Definition of EER process
▪ Risk and performance tool
▪ Filling selected data needs
▪ RPT, case studies
▪ Approaches to performance-based standards
▪ Consultation with stakeholders

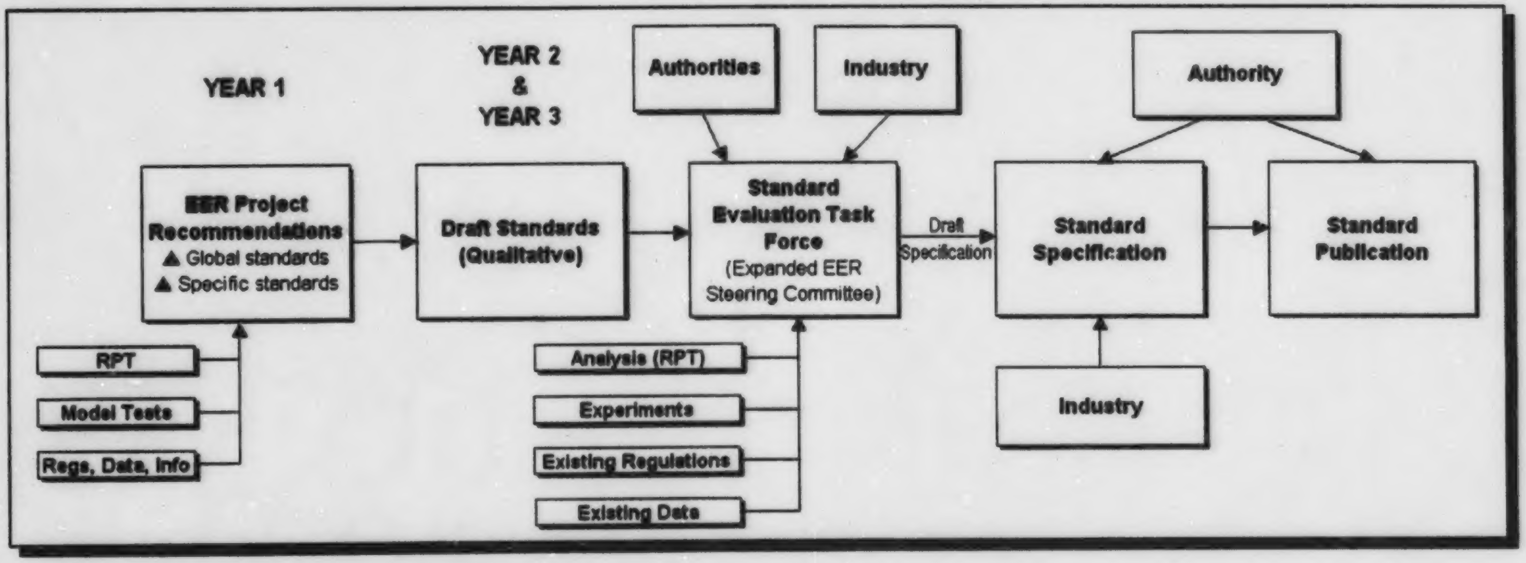

YEAR 1
YEAR 2
&
YEAR 3
EER Project Recommendations
▲ Global standards
▲ Specific standards
RPT
Model Tests
Regs, Data, Info
Draft Standards (Qualitative)
Authorities
Industry
Standard Evaluation Task Force
(Expanded EER Steering Committee)
Analysis (RPT)
Experiments
Existing Regulations
Existing Data
Draft Specification
Standard Specification
Industry
Authority
Standard Publication

Figure 6.2 Performance standards development

Table 6.6 Future steps

YEAR 2
• Establish Standard Evaluation Task Force
• Define form of performance-based standards
• Draft preliminary performance-based standards
• Consult stakeholders
• Specify (qualitatively and/or quantitatively) performance-based standards
• Conduct work to fill data gaps (EER research program packages, Section 6.6)
• Draft specifications of performance-based standards
YEAR 3
• Consult stakeholders on draft specifications
• Conduct work to fill final data gaps
• Define detailed specifications and consult stakeholders
• Finalize specification and promulgation of performance-based standards

6.6 EER Research Program Requirements to Support Standard Development

Although the work done under this EER research program to date provides a good basis for starting the development of performance-based standards, it does not provide enough to finish it. There is adequate information from the combination of literature search, new and existing data, full-scale and model-scale tests, and RPT development and application to provide a basis for the standard development program as outlined in Section 6.5.

The major research requirement still to be met relates to the determination of HF and equipment performance parameters to be used for simulating the two types of extreme conditions: catastrophic accidents and extreme environments. What they have in common is that both are life threatening. Accounts of life-threatening offshore accidents show that people behave very differently and unexpectedly under life-threatening conditions than they do under the urgent but relatively safe conditions of drill or precautionary evacuations for which the RPT has been found to perform adequately. In the account of the Ocean Odyssey [29], where abandonment was necessitated by an ignited natural gas blowout, although casualties were limited, personnel behaved in a range of irrational patterns – from taciturn to wild, from normal to bizarre – and physical components of the EER system failed due to accident conditions (e.g., audio alarm drowned out by blowout noise). The Ocean Ranger disaster [25], exacerbated by severe weather, reveals similar personnel behaviour erraticity and component malfunctions, which would not occur under the moderate-weather or personnel conditions that are easily simulated with the RPT.

The EER process is intended to protect and save personnel in accident situations. It implicitly deals with life-threatening conditions; therefore, meaningful EER standards must also apply to life-threatening conditions. Although we can now identify the aspects of life-threatening and extreme conditions that need to be quantified, we still have to do the associated research work. This will provide the necessary parameters and factors for the RPT so that it can be applied with reasonable validity to extreme conditions – the essence of EER intent.

Specific areas that can fill the data gaps to facilitate our ability to simulate physical system and human performance under such extreme conditions may be summarized as follows:

- Human performance under extreme conditions
- Environmental and accident effects on human performance
- Environmental and accident effects on EER system physical components
- Integration of the data generated from these research activities

Table 6.7 summarizes the programs identified above, while further details follow in the balance of this section.

Table 6.7 EER research to support standard development

ITEM	RESEARCH AREA	SUBSECTION
1	Human performance under extreme conditions	6.6.1
2	Environmental and accident effects on human performance	6.6.2
3	Environmental and accident effects on EER system physical component reliability	6.6.3
4	Additional data compilation	6.6.4
5	Site visits and training	6.6.4
6	Detailed planning of experiments	6.6.4
7	Integration of new data into RPT	6.6.4

6.6.1 Human Performance Under Extreme Conditions

The principal difficulty with simulating EER under extreme accident conditions is the lack of reliable data on human performance under extreme, life-threatening conditions. Such life-threatening conditions include either or both extreme accidents such as an uncontrolled fire (say, from an ignited gas blowout) rapidly impairing an installation's integrity, and/or the need to evacuate under severe or extreme weather conditions and associated rescue attempts. In all cases there is significant threat of loss of life and conditions are extremely abnormal. Although much has been said about the subject (as revealed in the literature search), quantitative data on human performance (e.g., speeds on stairs and ladders, operations, error rates, group behaviour) under such extreme conditions do not exist. We have seen significant variations already between individual and group performance from the simple experiments performed under this project (Chapter 4), but none of this is under life-threatening conditions. How can this be approached? Definitely not through full-scale human experiments, and mice are not good enough models (of humans) for this either! When there are no data for a specific condition and experiments cannot be carried out, but real occurrences have taken place and are documented, there are two main approaches to the problem:

1. Review historical data;
2. Conduct discussions with experts using the Delphi Technique.

The process may be summarized as follows:

- Analyse all available historical descriptions (e.g., Ocean Ranger, Piper Alpha, Ocean Odyssey);
- Discuss and refine the findings with experts using the Delphi Technique;
- Quantify the findings, incorporate into simulator (RPT), simulate, and again apply Delphi methods with the experts;
- Finalize the HF parameters and factors (e.g., panic factor effect on error rate and performance);
- Run RPT for extreme conditions to generate performance standard basis.

6.6.2 Environmental and Accident Effects on Human Performance

The full-scale experiments described in Chapter 4 identified shortcomings in existing data. The data obtained in the full-scale experiments, which were correctly documented and fully verified, were in many cases different from what has been used in the industry, and showed significant variations between individual performance alone and in groups. It is likely that similar differences between industry data and real performance may exist in the factors used to predict human performance under the impact of the effects of smoke, visibility, noise, and urgency, as well as environmental effects such as cold, wind, precipitation, and darkness. An optimal program to evaluate these factors using the HF evaluation methodology described in Chapter 4 is needed. Effects will be restricted to moderate and severe levels (not extreme) to ensure the safety of experimental subjects. However, it is expected that sufficient performance impacts (for these effect levels) will occur to permit quantification of statistically robust error rate and time performance factors.

6.6.3 Environmental and Accident Effects on EER System Physical Component Reliability

TEMPSC launch success varies with environmental conditions and induced installation effects; certain sea state or wind conditions preclude successful use of any liferaft. Accident effects such as thermal radiation, shock waves, or excessive noise can incapacitate essential links in the EER system chain. Quantitative specification of such interactive phenomena can be addressed through a combination of reliability analysis and model experimentation to provide parameters and factors essential for adequate EER simulation and ultimate setting of meaningful performance standards to adequately protect against common environmental and accident conditions necessitating EER.

6.6.4 Research Support and Data Integration into RPT

To ensure the success of the research programs outlined in subsections 6.6.1 through 6.6.3, certain research support functions are needed, as follows:

- Site visits and participation in offshore training programs by members of the Standard Development Task Force to provide a better appreciation of the EER process in action.
- Compilation of additional existing data, including private databases, operator data, and other relevant information.
- Detailed planning of all full-scale and model experiments to assure their optimal performance and data yield to complement the standard development process.
- Incorporation into the RPT of parameters generated from the research – outlined in subsections 6.6.1, 6.6.2, and 6.6.3 – and subsequent RPT optimization.
- Case studies with the RPT to generate information in support of standard development.

7. CONCLUSIONS AND RECOMMENDATIONS

7.1 Summary of Work

A multidisciplinary EER research program was initiated by TDC effective January 1, 2000, to lead to the implementation of performance-based EER standards for the East Coast offshore oil and gas industry. The work was carried out with Bercha Engineering Limited as prime contractor, together with seven subcontractors providing expertise or facilities in their areas of EER specialization. The principal tasks of the work included the following:

- Worldwide data and literature compilation and review.
- Development of a computerized EER simulator, the RPT.
- HF experiments for essential RPT inputs.
- Application of the RPT to specific case studies.
- Design of a program for the development of performance-based EER standards.
- Reporting, conclusions, and recommendations.

The worldwide data and literature search was conducted online through institutional libraries, organizations' and manufacturers' libraries, and the Bercha network. More than 640 entries were recorded, documented, and forwarded to National Research Council Canada (NRC) for inclusion in the EER website.

The RPT is a computerized model capable of simulating both the performance and the risks (success or failure) of components of any EER system both individually and together as a whole. RPT architecture is illustrated in Figure 7.1. One of the important outputs of the RPT is a ranking or estimate of the success that a given EER component configuration is likely to achieve for different environmental conditions. The RPT can operate either in a point value mode or a Monte Carlo mode. The Monte Carlo mode is advantageous not only because it permits the simulation of uncertainties through use of input distributions, but also because it eliminates the need for extensive network analysis of alternatives by incorporating appropriate decision distributions.

Some of the data gaps identified in the initial use of the RPT required the conduct of various experiments on human performance. Such experiments were designed and conducted at the Survival Systems test facility in Halifax Harbour.

Application of the RPT to several case studies illustrated its use in the identification of potential performance-based EER standards. Such EER standards, as well as those of other jurisdictions, facilitated the definition of a broad framework for EER standards categories and the developme

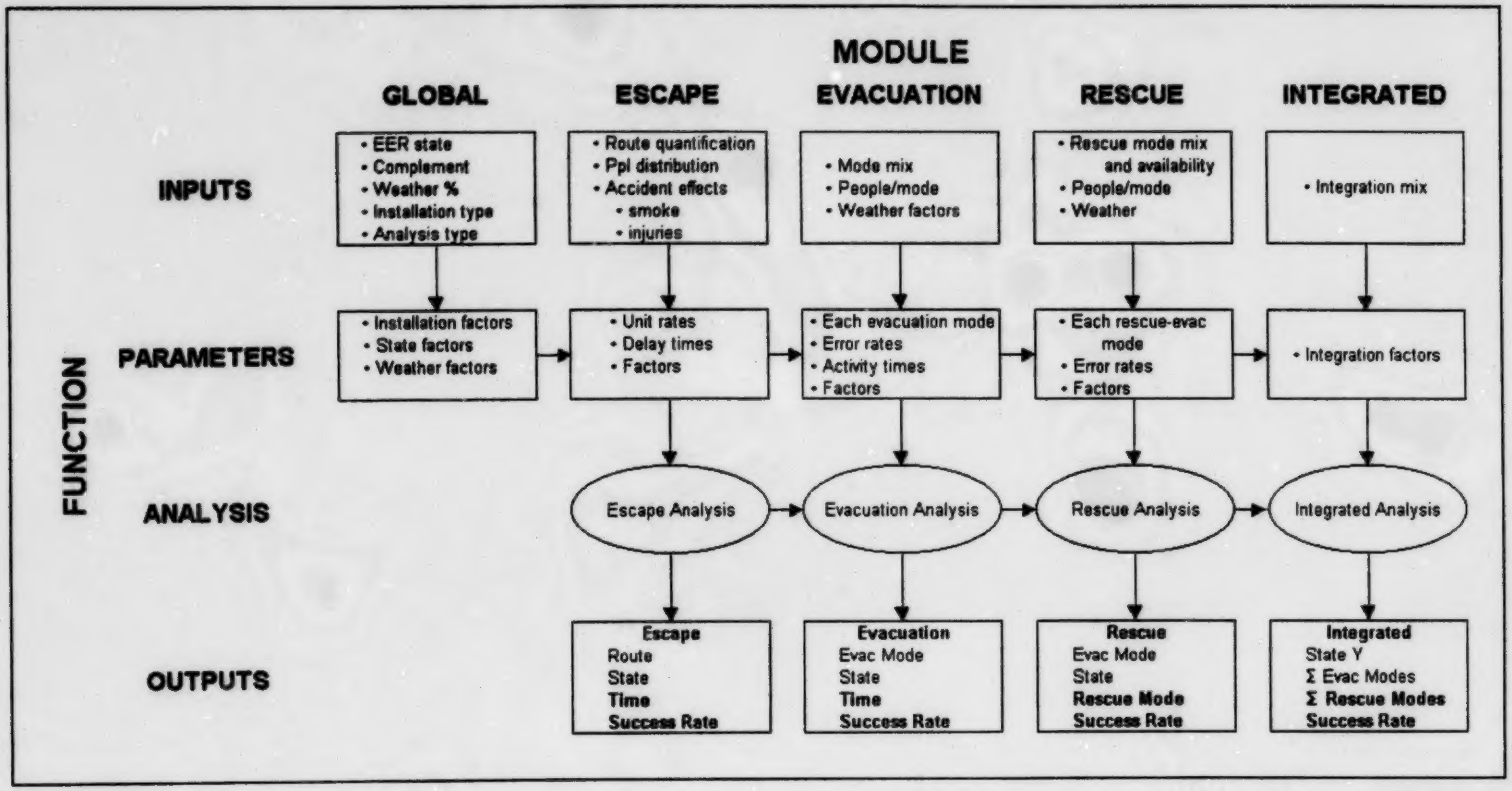

MODULE
GLOBAL
ESCAPE
EVACUATION
RESCUE
INTEGRATED
FUNCTION
INPUTS
PARAMETERS
ANALYSIS
OUTPUTS
• EER state
• Complement
• Weather %
• Installation type
• Analysis type
• Route quantification
• Ppl distribution
• Accident effects
• smoke
• injuries
• Mode mix
• People/mode
• Weather factors
• Rescue mode mix and availability
• People/mode
• Weather
• Integration mix
• Installation factors
• State factors
• Weather factors
• Unit rates
• Delay times
• Factors
• Each evacuation mode
• Error rates
• Activity times
• Factors
• Each rescue-evac mode
• Error rates
• Factors
• Integration factors
Escape Analysis
Evacuation Analysis
Rescue Analysis
Integrated Analysis
Escape
Route
State
Time
Success Rate
Evacuation
Evac Mode
State
Time
Success Rate
Rescue
Evac Mode
State
Rescue Mode
Success Rate
Integrated
State Y
Σ Evac Modes
Σ Rescue Modes
Success Rate

Figure 7.1 Expected value RPT architecture and screen references

A general program for the development of EER standards was designed, defining global and specific performance standards, a Standards Development Task Force, and specific research requirements for meaningful standards applicable to extreme conditions normally associated with the types of emergencies for which offshore EER systems need to be used.

The reporting phase consisted of progress and final reporting. Four progress reports were generated and presented at strategic progress meetings throughout the work. The final report generally incorporates the information from the progress reports and expands the description of the performance-based standard development program.

7.2 Conclusions

7.2.1 General Conclusions

The following general conclusions are drawn from the work:

- Although extensive model data and literature exist on EER, information and data meeting the objectives of the present work are not readily available.
- EER performance in extreme conditions is anecdotally described, but no directly usable parameters are given.
- The EER RPT developed under this work has been found to adequately simulate the reliability and performance of EER procedures under drill and calm-to-moderate environmental conditions.
- RPT simulation of life-threatening circumstances or extreme environmental and accident conditions is built into the RPT, but cannot be reliably simulated because of a lack of statistically robust input parameters.
- The RPT serves to point out specific data gaps to permit adequate simulation of life-threatening situations and therefore serves as a good basis for additional EER research recommendations.
- The performance-based standard development program should proceed without delay. Both a categorization of standards and a two-year development program have been presented in this report.

7.2.2 Data Compilation Conclusions

More than 640 individual entries relevant to EER and EER systems, procedures, and regulations have been identified and catalogued under this project. Although many aspects of EER knowledge are represented in these data and literature, none are immediately applicable to the fulfilment of all the objectives of the current work, particularly extreme condition human and equipment performance. Many items, however, provide good supporting information such as anecdotal descriptions of EER performance under extreme conditions (e.g., Ocean Ranger and Ocean Odyssey).

7.2.3 RPT Development Conclusions

The following conclusions on the RPT may be reached:

- The RPT adequately simulates performance and success rate for EER processes for which validation data were available. Such processes were restricted to drills under calm or moderate environmental conditions.
- The RPT has incorporated in it features that simulate EER under severe and extreme conditions. Because of input parameter inadequacy for such conditions, associated simulation results are unreliable. Generally, the required input parameters pertain to human and physical component performance under extreme conditions.
- Application of the RPT in its current state to specific case studies provides a wealth of information applicable to the development of performance-based standards. This information ranges from very specific items such as the importance of abandonment time limits, to very general information such as the overall EER success rate illustrated in Figure 7.2.
- As can be seen in Figure 7.2, the success rates for the severe and extreme weather conditions currently predicted are unacceptably low – probably because of the need to err on the side of conservatism with uncertainties in input data.

7.2.4 HF Data Generation

The HF data experiments designed and conducted under this program generated excellent verifiable data and set a format or template for conducting further experiments. The data collected were for relatively simple escape parameters; however, certain important relationships among individual and group performance parameters, which had not previously been identified, were quantified in these experiments.

7.2.5 RPT Application to Case Study

The RPT was successfully applied to a case study based on SOEP Tier I safety case development. Both the point value and a Monte Carlo mode were applied and extensive sensitivity studies on the effect of altering the EER system configuration were carried out. Typical high level results from the case study are summarized in Table 7.1.

7.2.6 Development of Performance-Based Standards

A program for the development of performance-based standards can be initiated on the basis of the work to date under this EER project. Additional research will be required for the development of performance-based standards that will be applicable to protect personnel adequately in severe or extreme conditions such as those encountered in many emergencies necessitating the use of EER systems.

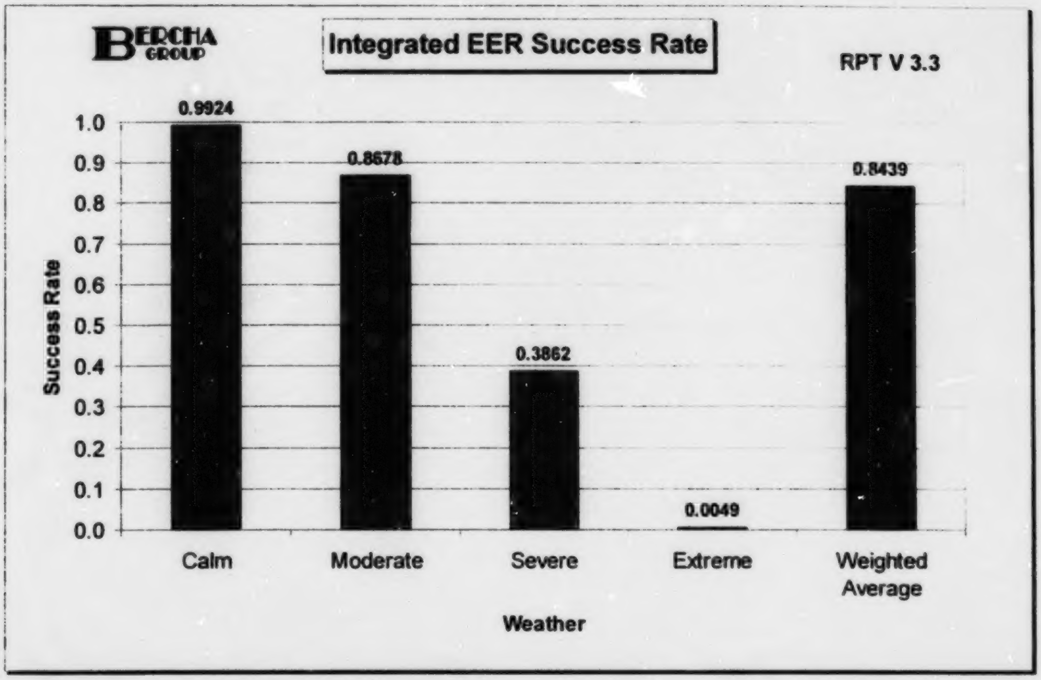


Figure 7.2 Integrated EER success rate

Table 7.1 Results from RPT case study application

ITEM	RESULTS
1	Escape success is high, provided alternative routes to TSR from each location exist.
2	All cases are good for calm weather and very bad for extreme weather.
3	Performance in moderate and severe weather is what really counts.
4	Combinations of independent systems perform better than ones with interdependent systems.
5	Low helicopter availability decreases expected evacuation success, but total dependence on helicopters also reduces evacuation success due to their limited severe/extreme weather capability.
6	Abandonment (escape plus evacuation) time limit is very critical and all cases perform poorly for very short abandonment times.
7	RPT clearly shows sensitivity of EER success to different EER configurations.

7.3 Recommendations

7.3.1 General Recommendations

The following general recommendations can be made based on the work described in this final report:

- Proceed without delay with the performance-based standards development program.
- Continue EER research in critical areas, including human and physical component performance under severe and extreme conditions.
- Optimize the RPT as additional data become available from the research programs.
- Utilize the RPT in support of the performance-based standards development program.

7.3.2 Data Compilation Recommendations

The following recommendations relate to data compilation and cataloguing:

- Compile all newly identified data and literature, including that from private and operator databases.
- Continue to catalogue the data and incorporate it into the NRC EER database and website currently under construction.

7.3.3 RPT Development

The following recommendations can be made in relation to RPT development:

- Continue to optimize the RPT as new requirements or features are identified through its use in support of the performance-based standard development program.
- As severe and extreme condition personnel and system performance data become available, modify the structure of the RPT as warranted, and integrate the parameters and factors derived from the data into the RPT.
- Utilize the RPT in the standards development program.

7.3.4 HF Data

The following research programs are required to fulfil the needs of the RPT for the simulation of risk and performance under accident and extreme environmental conditions:

- Human performance under extreme conditions.

- Environmental and accident effects on human performance in moderate to severe conditions.
- Environmental and accident effects on EER system physical components under extreme conditions.

7.3.5 RPT Applications

Continue to use the RPT for selected case studies as required in support of the standards development program. Application of the RPT to life-threatening and extreme environment situations should be done first to identify the data gaps, and then with caution until the necessary research to identify and quantify appropriate parameters has been completed and integrated into the RPT. Once these parameters are quantified, the RPT will be the state-of-the-art method for analyzing EER under the full spectrum of accident, complement, and environment conditions from calm to extreme.

7.3.6 Performance-Based Standard Development Program

The performance-based standard development program flow chart for the next two years is illustrated in Figure 7.3. As can be seen, important elements of the standards development program include the following:

- Establishment of a Task Force of appropriate representation from regulators, industry, and technical experts from the EER community.
- Stakeholder consultation outside the confines of the Task Force.
- A systematic sequential approach to the development of performance-based standards, including the following steps:
  - Definition of form and categories of standards illustrated in Figure 7.4.
  - Initial draft of standards.
  - Conduct of necessary research to fulfill information requirements as outlined in subsection 7.3.4 for extreme conditions.
  - Specification of standards including quantitative thresholds for different states of emergencies.
  - Final drafting and specification of standards.
  - Promulgation of standards.
- Conduct of the necessary supportive research, summarized in Table 7.2, to assure the development of standards that are meaningful for life-threatening situations against which they are intended to protect personnel.

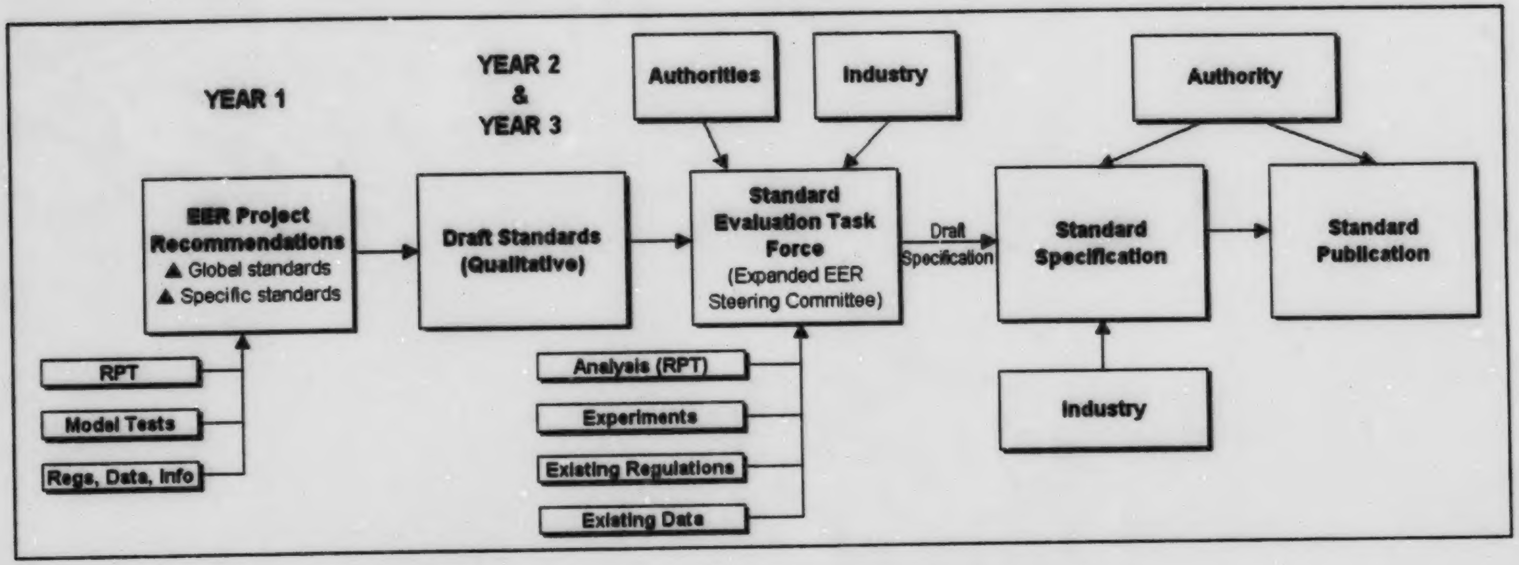

YEAR 1
YEAR 2
&
YEAR 3
EER Project Recommendations
▲ Globel standards
▲ Specific standards
RPT
Model Tests
Regs, Data, Info
Draft Standards (Qualitative)
Authorities
Industry
Standard Evaluation Task Force
(Expanded EER Steering Committee)
Analysis (RPT)
Experiments
Existing Regulations
Existing Data
Draft Specification
Standard Specification
Industry
Authority
Standard Publication

Figure 7.3 Performance standards development program

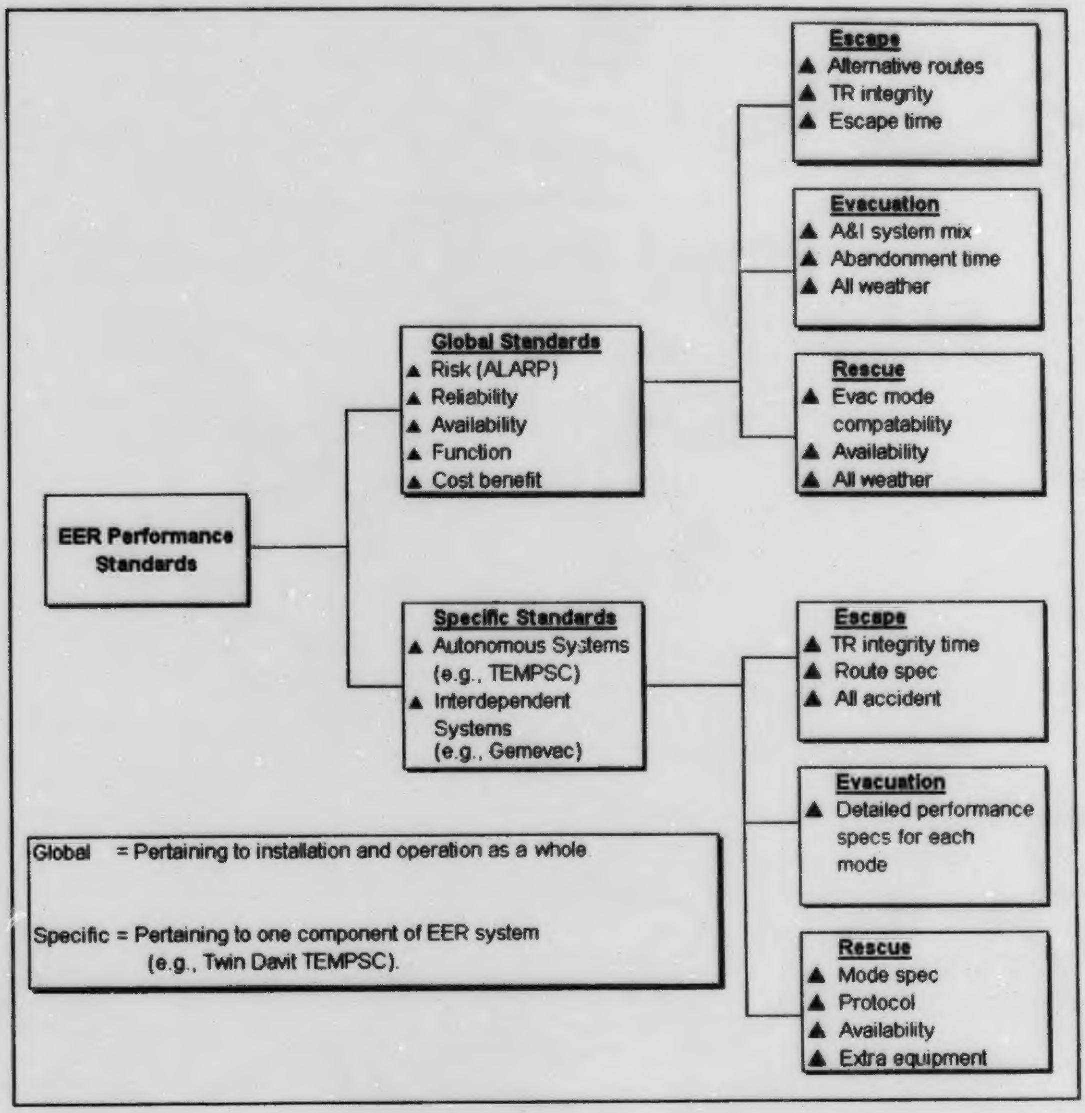

EER Performance Standards
Global Standards
▲ Risk (ALARP)
▲ Reliability
▲ Availability
▲ Function
▲ Cost benefit
Escape
▲ Alternative routes
▲ TR integrity
▲ Escape time
Evacuation
▲ A&I system mix
▲ Abandonment time
▲ All weather
Rescue
▲ Evac mode compatability
▲ Availability
▲ All weather
Specific Standards
▲ Autonomous Systems (e.g., TEMPSC)
▲ Interdependent Systems (e.g., Gemevac)
Escape
▲ TR integrity time
▲ Route spec
▲ All accident
Evacuation
▲ Detailed performance specs for each mode
Rescue
▲ Mode spec
▲ Protocol
▲ Availability
▲ Extra equipment
Global = Pertaining to installation and operation as a whole
Specific = Pertaining to one component of EER system (e.g., Twin Davit TEMPSC).

Figure 7.4 Performance standard categories

Table 7.2 EER research to support standard development

ITEM	RESEARCH AREA
1	Human performance under extreme conditions
2	Moderate and severe environmental and accident effects on human performance
3	Environmental and accident effects on EER system physical component reliability
4	Additional data compilation
5	Site visits and training
6	Detailed planning of experiments
7	Integration of new data into RPT

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Appendix A

Worldwide EER Data and Literature Search
& East Coast Marine Equipment Specifications

APPENDIX A

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A. Worldwide EER Data and Literature Search & East Coast Marine Equipment Specifications A-1
A.1 Worldwide EER Data and Literature Search I (Results to March 31, 2000) A-1
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A.3 North Sea Data Listings A-102
A.4 East Coast Marine Equipment Specifications A-106

A. Worldwide EER Data and Literature Search & East Coast Marine Equipment Specifications

Code Legend:

a = Accidents and accident analysis
ea = East Coast
eer = EER
es = Escape
ev = Evacuation
h = Human factors
m = Miscellaneous
n = North Sea & NSR
p = Preparedness (e.g., safety training, maintenance, drills)
r = Regulations
re = Rescue

A.1 Worldwide EER Data and Literature Search I (Results to March 31, 2000)

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
338	.	Ocean Ranger [video recording]	a	[S.L. : Canadian Broadcasting Corporation	1984	Canada	unpaged	Subjects: Drilling platforms - Accidents - Safety measures Marine accidents - Newfoundland Ocean Ranger. Notes: VHS. Time 23 minutes.	video	NEB TN871.3/O24/Video	U
262	.	PARLOC 92: the update of loss of containment data for offshore pipelines/ prepared by Advanced Mechanics & Engineering Limited; for the Health and Safety Executive.	a	HSE Books	1994	England	unavail.	.	report	NEB TN871.3/P37/1992	U
315	.	Report one and two / Royal Commission on the Ocean Ranger Marine Disaster.	a	Royal Commission on the Ocean Ranger Marine Disaster	1984-85	St. John's, Nfld.	vol. 1 400; vol.2 308; vol.3 189	Summary: *Report One* - The primary purpose of this report is to set forth the results of the inquiry of the Royal Commission into the loss of the Ocean Ranger and its crew. This inquiry has addressed three basic questions: Why did the Ocean Ranger capsize and sink? Why was none of the crew saved? How can other similar disasters be avoided? This report will provide an answer to the first two questions and an initial response to the third. A broad investigation has been launched into this third area to identify practical means of improving human safety during drilling operations off the east coast of Canada. *Report Two* - this final report presents the results of investigation into the third area, the goal of which was to identify ways and means of improving	report	NEB TN871.3/R69/1984-85	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
								human safety during exploratory and delineation drilling operations off eastern Canada. *Report Two Volume Three* - Summaries of the seminar proceedings and of selected study reports are included in this volume.			
408	.	Report of investigation into the circumstances attending the capsizing of the Canadian Coast Guard FRC No.244 from the CCGS "Sir Wilfred Grenfall" resulting in one death and three presumed deaths (including the body surfer) whilst responding to the rescue mission at Middle Cove Newfoundland, October 15, 1989.	a	unavail.	1989	unavail.	unavail.	Summary: Report of investigation into the circumstances attending the capsizing of the Canadian Coast Guard FRC No.244 from the CCGS "Sir Wilfred Grenfall" resulting in one death and three presumed deaths (including the body surfer) whilst responding to the rescue mission at Middle Cove Newfoundland, October 15, 1989.	report	C-NOPB VK1255S5T7 1989	U
59	Alaskan Oil Spill Commission	Spill. The wreck of the Exxon Valdez. Implications for safe transportation of oil.	a	State of Alaska	1990, xii	unavail.	224	Summary: Report of official commission appointed by Governor of Alaska to review issues raised by Exxon Valdez disaster and to recommend ways to resolve these. Investigated both the causes of oil spill and subsequent clean-up operation.	book	SPRI Shelf(*49): 504.054:665.6	U
221	Aldwinkle, D.S.; Lewis, K.J.	Prediction of structural damage, penetration and cargo spillage due to ships collisions with icebergs.	a	Lloyd's Register of Shipping	1984	Crawley, England	unavail.	.	book	NEB VK1299/A64	U
31	Anon.	Argentine ship sinks near Palmer Station	a	Antarctic Journal of the United States	1989	US	3-7	Summary: Details response of Argentina and of US personnel at Palmer Station to grounding of Argentine vessel Bahia Paraiso in January 1989, rescuing and accommodating the tourists and crew aboard, and attending to resulting fuel spill. Includes table of primary processes that degrade or disperse oil and fuel in the sea.	periodical	SPRI	U
68	Anon.	Tragedy at Sea.	a	Falkland Islands Newsletter	1998, 73	unavail.	:3	Summary: Brief report on shipwreck of South African fishing vessel Sudur Havid off South Georgia in June 1998.	periodical	SPRI	U
62	Anon.	Coroner announces open verdict case of Sudur Havid.	a	Penguin News	1998, 10(19)	unavail.	:1	Summary: Brief announcement of verdict of inquest into the deaths of six crew members of fishing vessel Sudar Havid sunk off South Georgia.	periodical	SPRI	U
63	Anon.	Illegal fishing cause of Sudur Havid tragedy?	a	Penguin News	1999, 11(09)	unavail.	:1	Summary: Report on evidence at South African marine court of inquiry into sinking of Sudur Havid off South Georgia in June 1998, linking to illegal fishing for Patagonian toothfish.	periodical	SPRI	U
66	Anon.	Sudur Havid tragedy examined in court.	a	Penguin News	1998, 10(14)	unavail.	:1	Summary: Brief report on opening session of Coroner's Inquest into deaths of 17 crew members from fishing vessel sunk off South Georgia on 6 June 1998.	periodical	SPRI	U
67	Anon.	Survivors describe ordeal of Sudur Havid sinking.	a	Penguin News	1998, 10(15)	unavail.	1, 9-10	Summary: Report of Coroner's Inquest into deaths of six crew members of fishing vessel sunk off South Georgia on 6 June 1998. Includes testimony of Matthew Lewis, CCAMLR Observer on board.	periodical	SPRI	U
61	Anon.	Australia Antarctic Territory. Start to the 1998/1999 season interrupted by engine fire on board Aurora Australis.	a	Polar Post	1998, 30(4)	unavail.	:116	Summary: Brief account of engine room fire aboard Aurora Australis in July 1998, including details of changes to sailing schedules and alternative vessels.	periodical	SPRI	U
33	Arikaynen, A.	A systematic approach to the ice-navigation accident rate (Russian)	a	Morskoy Flot	1987, 8	unavail.	20-23	Summary: Examines ice-navigation accidents, risk of which statistically too high. Analyses their causes, with particular reference to Northern Sea Route. Emphasizes human factors. Suggests means of improving situation.	periodical	SPRI	U
72	Baarli, Johan.	Accidents with nuclear powered submarines in northern navigated	a	Polarboken	1989-90	unavail.	111-112	Summary: Considers accidents involving three Soviet nuclear submarines in water near Bear Island and possible radioactive leaks	periodical	SPRI	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
		waters, (Norwegian)						from them.			
593	Babrauskas, V.	Fire modeling tools for FSE: Are they good enough?	a	Journal of Fire Protection Engineering	1996	unavail.	unavail.	.	journal	USCG	U
607	Banks, J. and Rardin, R.L.	International comparison of fire loss.	a	Fire Technology	1982	unavail.	unavail.	.	journal	USCG	U
608	Bell, J.R.	Investigation report: Second Florida cruise ship fire.	a	Fire Journal	1985	unavail.	unavail.	.	journal	USCG	U
75	Berg, John Trygve.	Oil spills in cold climates	a	unavail.	unavail.	unavail.	unavail.	Summary: Oil spills in cold climates; with special reference to the transportation and exploration of hydrocarbons in the Kara Sea, and present and past exploration of the region. Describes hydrocarbon combat technology: monitoring chemical dispersants and additives, burning, mechanical containment and recovery. Details two possible oil spill scenarios for Kara Sea.	periodical	SPRI Theses	U
38	Brockett, Tom	Sea Search Ltd. A salvage expedition to raise gold from the General Grant.	a	n.pub.	1994	Christchurch, NZ	12	Summary: Information on proposed company to be formed to mount salvage operation to Auckland Islands. Includes account of wreck of General Grant in 1866; previous salvage attempts; and estimate of amount of gold carried.	book	SPRI Pam(*787.7):629.129	U
470	Brown, A.	Structural survey of oil tankers. In: IBC UK Conferences Ltd. Managing oil pollution risks in shipping operations : Prevention - International European and Commercial Initiatives - Conference (13 December 1995 : London.	a	IBC UK Conference Ltd.	1995	London	unavail.	.	paper	IMO Library	U
631	Budnick, E.K. and Nelson, H.E.	Simplified fire growth calculations.	a	in: Fire Protection Handbook	1997	unavail.	unavail.	.	book	USCG	U
601	Bukowski	How to evaluate alternative designs based on fire modeling.	a	NFPA Journal	1995 Vol.89, No.2	unavail.	unavail.	.	journal	USCG	U
596	Bukowski, Clarke III, Hall Jr., & Stiefel	Fire Risk assessment method: Description of methodology	a	unavail.	1990	unavail.	unavail.	.	.	USCG	U
39	Bulay, A.	The hard days of the Maksim Gor'kiy	a	Morskoy Flot	1989, 12	unavail.	34-38	Summary: Detailed account of Maxim Gor'kiy passenger cruise liner disaster (1989) near Spitzbergen. Author was eyewitness. Mentions allegations in foreign press of drunkenness amongst crew and partly upholds them. Includes reproduction of illustration exert from 3 July 1989 issue of Time.	periodical	SPRI	U
40	Callahan, Alston.	Arctic ice rescue - 1993	a	Explorers Journal	1993	unavail.	193-194	Summary: Account of trapping of diesel powered Russian icebreaker Kapitan Khlebnikov by ice in summer1993 and subsequent rescue by nuclear powered Yamal.	periodical	SPRI	U
78	Canada. Royal Commission on the "Ocean Ranger" marine disaster.	Report one, The loss of the semisubmersible drill rig "Ocean Ranger" and its crew.	a	Ministry of Supply and Services	1984, vii	St. John's, Newfoundland	400	Summary: Account of loss of the drilling rig "Ocean ranger" on the Grand Banks off Labrador in 1982.	report	SPRI (*61):622.24	U
82	Chikachev,	Local history sketches. (Russian)	a	Sakhapoligrafizdat	1994	Yakutsk	84	Summary. Collection of 20 short essays on people and events from	book	SPRI Shelf	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
	Aleksey Gavrilovich.							local history of Indigirka and Kolyma regions of northeastern Yakutiya. Includes early Russian settlers; contacts with Russian American; tragic sinking of Dal'story ships in 1993; Russians and shamanism; early navigation on Indigirka; political repression in 1940's; and incidents from history of air transport.		(*531.3):93[pub.1994]	
83	Chukova, Yu.	From Morzhovets to Chelyuskin. (Russian)	a	Morskoy Flot	1992, 4/5	unavail.	46-47	Summary: Recounts life of Anna Petrovna Sushkina, biologist, and artist, who was on board Chelyuskin when it was crushed by ice in 1934. Describes incident when she was stranded on Ostrov Morzhovets (Arkhangel'skaya Oblast').	periodical	SPRI	U
85	Coates, Kenneth S. and Morrison, William Robert.	The sinking of the Princess Sophia: taking the north down with her.	a	Oxford University Press	1990	Toronto	216	Summary: Account of loss of Canadian Pacific steamer on October 23, 1918, Sailing from Skagway, Alaska, to British Columbia. 353 passengers and crew lost comprised significant cross-section of then Yukon and Alaskan population.	book	SPRI Shelf(*430):93[1990]	U
185	Conrad, Joseph	Protection of Ocean Liners (1) (1914) (1) The loss of the Empress of Ireland. From Notes on life and letters (1921)	a	www.royal.ab.ca/gaslight/contit03.htm	1921	World Wide Web	6	Summary: This excerpt from notes on life and letters (1921) outlines reasons for the sinking of the Empress of Ireland. Conrad suggests ways in which this disaster could have been prevented.	internet document	www.royal.ab.ca/gaslight/contit03.htm	U
192	Cullen, The Hon Lord	The public inquiry into the Piper Alpha disaster.	a	Department of Energy, UK	unavail.	UK	387-399	Summary: In this chapter the author sets out recommendations in the light of the matters discussed in Chapters 17-22. Each recommendation is followed by reference to the paragraph in the earlier chapter to which it is directly related. The recommendations are arranged according to subject pertaining to the Piper Alpha disaster.	excerpt from book	Bercha Government Publications UK1 EN 90P73 V.2	U
219	Cullen, W. Douglas	The public inquiry into the Piper Alpha disaster.	a	HMSO Publications Centre	1990	London	unavail.	Summary: This book covers the following subjects: Oil well drilling, Submarine - North Sea- Accidents Drilling platforms- North Sea - Accidents offshore structures - North Sea - Accidents Marine accidents - Great Britain Piper Alpha.	book	NEB TN 871.3/P4/1990	U
87	Darchen, Jacques.	The Titanic... and a certain iceberg. First part: birth of two giants. (French).	a	Met Mar	1992, 157	unavail.	2-11	Summary: Describes passenger liner, which was to collide with iceberg in North Atlantic on maiden voyage on 15 April 1912. Describes genesis of icebergs from ice shelves and glaciers.	book	SPRI Pam 656.608	U
88	De La Mare, A.J.	Joseph Hatch and the loss of Kakanui.	a	Invercargill Licensing Trust Charitable Trust	1990	New Zealand	66	Summary: Account of Hatch's involvement in elephant seal and penguin oil industries in New Zealand, in particular operations on Macquarrie island in 1889-90; relief voyage of Kakanui organized amid concerns for welfare of shore party; relief fund and inquiry into loss of vessel; and history of early campaign to protect penguins.	book	SPRI Shelf (*786):93	U
89	Dines, Victor	Marooned in the Arctic.	a	Wide World	1933, 72Nov&Dec	unavail.	87-94; 209-17	Summary: Narrative of attempt to establish fur-trading posts on Baffin Island, 1930, which ended in shipwreck. See SPRI MS 949/2 for another version.	book	SPRI Pam 91(08):(*3)[1930Dines]	U
90	Edholm, Otto G.	Those in peril on the sea.	a	New Scientist	1968, 37(584)	unavail.	346-348	Summary: Observations on the mate and sole survivor of the Hull trawler, Ross Clevland, which foundered off Iceland.	book	SPRI Pam 656.608	U
471	Fairplay Publications Ltd.	Guide to marine Propulsion	a	Fairplay Publications Ltd.	1997 August	Coulsdon	unavail.	.	periodical	IMO Library	U
92	Ferragut. C; Perchanok, Max S. and Daley, C	Ship/ice probabilities in Arctic shipping. In: Sackinger, William M. and Jefferies, Martin O., eds. Port and ocean engineering under Arctic conditions. Vol. I.	a	University of Alaska Fairbanks. Geophysical Institute	1988	Fairbanks, Alaska	631-643	Summary: Introduces conceptual model to estimate collisions experienced on shipping route in Arctic waters. Poisson model used to estimate uncertainty in presence of hazardous ice. Uncertainty on encounter, detection and avoidance are incorporated in model through use of probabilistic distributions or second-order statistical information of basic random environmental variables such as ice thickness, ice concentration, and visibility. Discussion, p. 643. Note: Proceedings of Ninth Conference (POAC-87) on Port and ocean Engineering under Arctic Conditions, held at University of Alaska, Fairbanks, AK, 17-21	book	SPRI Shelf (*3):626	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
								August 1987.			
224	Fischer, David W.	Managing technological accidents: Two blowouts in the North Sea : incorporating the proceedings of an IIASA Workshop on Blowout Management, April 1978	a	Pergamon Press	1982	England	234	Summary: The proceedings of an IIASA Workshop on blowout management with focus on two blowouts in the North Sea. This book describes the system within which blowouts occurred and summarizes post 1977 thinking by both the oil industry and its government regulators. It does not attempt to find fault with either industry or government; nor does it provide a technical description of the two blowouts that occurred. Rather, it aims to place the blowouts in the larger framework of disaster management. This means that blowouts are viewed as examples of an important man-technology interface with a potential for disastrous consequences, thus demanding a broad range of management skills.	workshop proceedings	NEB TN871.2/M35	U
94	Glasinovic, Sergio Lausic, ed.	Antarctica, continent of hope. (Spanish)	a	Museo "Mayorino Borgatello"	1990	Punta Arenas	140	Summary: Fifteen contributions consider topics including conservation, shipwreck, architecture, tourism, marine mammals as resources, and history of Antarctic exploration. Note: Papers presented at Primera Jornadas Anarcticas. 21-26 August 1989, Punta Arenas.	book	SPRI	U
95	Gordeychik, V	Survivors of the Chelyuskina. (In commemoration of the 55th anniversary of the culmination of the epic of the Chelyuskin.) (Russian)	a	Morskoy Flot	1989, 3	unavail.	55-59	Summary: Deals with causes and consequences of possibly over-ambitious decision of Head Office of Northern Sea Route (Glavsevmorput') to send icebreaker Chekyuskin along Northern Sea Route in1934. Recounts ship's sinking in Chukchi Sea, and subsequent rescue of survivors.	periodical	SPRI	U
96	Gore, Damian.	Aurora Australis in trouble, but now safe home.	a	Antarctic News and Views	1998, 3	unavail.	9-10	Summary: Reports on fire aboard Aurora Australis, including reprints of information releases from Australian Antarctic Division website.	periodical	SPRI	U
97	Hadfield, R.L.	Sea-toll of our time. A chronicle of maritime disaster during the last thirty years drawn from authentic sources.	a	H.F.&G. Witherby	1903, viii	London	239	Summary: Includes Waratah bound from Durban to London, which disappeared without trace in July 1909, and several search expeditions p.63-69; wreck of Titanic 15 April1912, p.129-47	book	Not in SPRI, Cambridge University Library	U
555	Hall, J.R.	A fire risk analysis model for assessing options for flammable and combustible liquid products in storage and retail occupancies	a	Fire Technology	1995	unavail.	unavail.	.	journal	USCG	U
294	Harms, Volker W.	Computer manual for calculating wave-height distributions about offshore structures.	a	State University of New York at Buffalo	1979	Buffalo N.Y.	unavail.	.	Mfiche	NEB TC172/C65/Mfiche	U
543	Harris, L.M.	Design for reliability in deepwater floating drilling operations.	a	unavail.	1979	unavail.	unavail.	.	book	UofC TN871.3 .H345	U
473	Hellenic Marine Environment Protection Association (HELMEPA)	Helmepa Index : Software package for tanker vessels 1st Revision.	a	unavail.	1996	Athens	unavail.	.	Software package	IMO Library	U
542	House, J.D.	But who cares now? : The tragedy of the Ocean Ranger.	a	Breakwater	1987	St. John's NFLD	94	Subject: Ocean Ranger, drilling platforms, accidents, marine accidents, social aspects, Newfoundland.	book	UofC TN871.3 .H68	U
641	Ignall.	The Fire Operations Simulation Model.	a	in: Fire Department Deployment Analysis. Walker, Chaiken and Ignall (eds.)	1979	unavail.	unavail.	.	book	USCG	U
106	Imbert, Bertrand	Jean-Baptiste Charcot, pioneer of the Polar seas. (French)	a	Met-Mar	1996, 173	unavail.	29-38	Summary. Account of Charcot's Antarctic and Arctic voyages, including description of Pourquoi-pas? And meteorological conditions at time of shipwreck off coast of Iceland in 1936.	book	SPRI Pam 92[Charcot, Jean-Baptiste]	U
474	Institute of	Decommissioning of offshore oil	a	The Institute of Marine	1996	London	unavail.	.	book	IMO Library ISBN 0-907206-	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
	Marine Engineers (IMARE)	and gas installations - Proceedings of the four-day symposium (16-19 September 1996 : Aberdeen).		Engineers						76-X	
499	International Organization for Standardization (ISO)	Reaction to fire tests : Horizontal surface spread of flame on floor covering systems : Part 1 - Flame spread using a radiant heat ignition source.	a	ISO	1997	Geneva	unavail.	.	book	IMO Library (ISO 9239-1)	U
500	International Organization for Standardization (ISO)	Reaction to fire tests : Ignitability of building products subjected to direct impingement of flame. Part 3 : Multi-source test.	a	ISO	1997	Geneva	unavail.	.	book	IMO Library (ISO 11925-3)	U
501	International Organization for Standardization (ISO)	Reaction to fire tests : Ignitability of building products subjected to direct impingement of flame. Part 2 : Single flame source test.	a	ISO	1997	Geneva	unavail.	.	book	IMO Library (ISO 11925-2)	U
653	Jones, W.W.	A Multicompartment Model for the spread of fire, smoke and toxic gases.	a	Fire Safety Journal	1985 Vol. 9	unavail.	unavail.	.	journal	USCG	U
109	Jorsep.	The epic of Chilean whaling industry. (Spanish)	a	Revista de Marina	1997, 6	unavail.	544-553	Summary: History of Chilean whaling industry, boy pelagic and shore based. Includes sinking of Essex after being attacked by whale in 1820; operations of Empresa Ballenera Macaya from 1880 to 1970's; Adolf Andresen and early Norwegian-Chilean whaling; and Chilean whaling companies of 1920's and 1930's.	periodical	SPRI	U
110	Karavanov, S.B.	A comparative evaluation of the probability of damage to the hulls of ships in the Arctic and in non-ice regions of the world ocean. (Russian) In: Panin, Yu. I., ed. The architectural structural type and nautical and ice qualities of prospective vessels: collected studies.	a	Transport	1984	Leningrad	80-84	Summary: Comparative analysis of relative accident rate of transport vessels of world fleet and Arctic fleet. Also determines expected frequencies of incidents of hull damage to cargo vessels in Arctic.	book	SPRI Shelf 629.124.791	U
595	Katzin, Khoury & Artani	Fire Risk Analysis and Assessment for the Canadian building code assessment framework	a	Fire Hazard and Fire Risk Assessment	1992	unavail.	unavail.	.	.	USCG	U
114	Korel'skiy, V.F.	Everything possible was done. (Russian)	a	Rybnoye Khozyaystvo	1990, 5	unavail.	27-28	Summary: Text of a letter sent to newspaper Komsomol'skaya Pravda rejecting allegations in the issue of 17 December 1989 that Northern fishing fleet was slow in escaping crew-members of nuclear submarine Komsomolets in Norwegian Sea on 7 April 1989. Newspaper had alleged that fishing fleet demanded payment of Northern Fleet (Navy) for rescue, and that ensuing negotiations had delayed rescue by two hours with resultant loss of life.	periodical	SPRI	U
115	Kurchatov, Alexander.	Nuclear arsenals for terrorist.	a	Moscow News	1996, 35	Moscow	:4	Summary: Report on threat to safety of Russia's nuclear weapons from criminals, in particular ro weapons at present stored in unguarded underwater cellars including atomic submarine Komsomolets in which sank in Norwegian Sea in 1989.	periodical	SPRI	U
47	Lamekhov, A and Smolyagin, V	Courage is needed in the ice! We discuss A. Arikaynen's article " Lowering the accident rate of ice-navigation vessels is a complex	a	Morskoy Flot	1988, 10	unavail.	36-37	Summary: Reply to named article. Argues main safety risk is aging fleet. Criticizes Arikayneb for over-cautious Approach to "risk" for allegedly looking for guilty parties instead of analyzing reasons for accidents. Authors are captains of nuclear icebreaker Rossiya and	periodical	SPRI	U

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		task' (Morskoy Flot 1987 (8) (Russian)						icebreaker Krasin.			
116	Lamekhov, A and Smolyagin, V.	Courage is needed in the ice! We discuss A. Arikaynen's article " Lowering the accident rate of ice-navigation vessels is a complex task."	a	Morskoy Flot	1987, 8	unavail.	36-37	Summary: Reply to named article. Argues main safety risk is aging fleet. Criticizes Arikayren for over-cautious approach to risk and for allegedly looking for guilty parties instead of analyzing reasons for accidents. Authors are captains of nuclear icebreaker rossiya and icebreaker Krasin.	perio dical	SPRI	U
117	Lord, Walter.	A night to remember.	a	Longmans, Green and Co.	1956	London	188	Summary: Sinking of RMS Titanic due to collision with iceberg in North Atlantic.	book	SPRI Shelf 629.12[Titanic]	U
118	Luk'yanov, Ye	Another Titanic? Fortunately not! About the accident with the liner Maksim Gor'kiy.	a	Soviet Shipping	1989, 9(4)	unavail.	:13	Summary: Describes briefly Titanic disaster and compares it to collision of Maksim Gor'kiy with ice floe off Svalbard, June 1989. Author (Deputy Chief of State Maritime Inspectorate) comments on incident and examines errors made by ship's master. Defends action taken by crew to rescue passengers.	perio dical	SPRI	U
48	Luk'yanov, Ye.	Official commentary [On Maksim Gor'kiy shipping disaster] (Russian)	a	Morskoy Flot	1989, 12	unavail.	38-39	Summary: Official Ministry commentary on passenger cruise-liner disaster (1989) near Spitzbergen. Records details of incident. Lists findings of commission on inadequacies of navigation and seamanship leading to disaster. Praises captain and crew for professionalism during passenger rescue operation. Praises captain for admitting not knowing reason for navigational mistakes. Records suspension of captain's license. Denies reports of drunkenness amongst crew.	perio dical	SPRI	U
119	Luxton, David.	The Pergolis family (and the loss of the Douglas Station cutter 100 years ago.)	a	Falkland Islands Journal	1986, 7(2)	unavail.	20-24	Summary: Account of shipwreck in Falkland Islands in 1898.	perio dical	SPRI	U
120	MacKenzie, Debora.	Row surfaces over sunken nuclear sub.	a	New Scientist	1993, 1891	unavail.	:7	Summary: Report on disagreements over findings of study by international team of scientists on effects of sinking of soviet nuclear submarine in Norwegian Sea which concluded that fisheries were unlikely to be contaminated in area; Norwegian oceanographers disagreed.	perio dical	SPRI Pam (*615):504.054	U
121	MacKenzie, Debora.	Russians ready to plug hole in wrecked sub.	a	New Scientist	1995, 1984	unavail.	6-7	Summary: Report on attempts by Russian research vessel to prevent leakage of plutonium from nuclear submarine Komsomolets, which sank in 1989 in Norwegian Sea, and thus contaminate fish stocks.	perio dical	SPRI Pam (*615):504.054	U
122	Maksimovsky, Valentin A.	Sources of technogenic radionuclide pollution (STRP) in the southern Arctic Ocean.	a	Arctic Research of the United States	1994, 8	unavail.	:309	Summary: Extended abstract of paper discusses radionuclides from all anthropogenic sources, including nuclear waste disposal, nuclear explosions, uranium mining and production, and their dispersal.	perio dical	SPRI	U
612	Marchant, E.W.	Modelling fire safety and risk.	a	in: An Introduction, in Fires and Human Behaviour - Canter (ed.)	1980	unavail.	unavail.	.	book	USCG	U
481	Marine Investigation Branch (MAIB)	Report of the Chief Inspector of Marine Accidents into the grounding and subsequent salvage of the tanker Sea Empress at Milford Haven between 15 and 21 February 1996.	a	MAIB	1997	Southampton	unavail.	Summary: Report of the Chief Inspector of Marine Accidents into the grounding and subsequent salvage of the tanker Sea Empress at Milford Haven between 15 and 21 February 1996.	report	IMO Library ISBN 0-11-551890-8	U
123	Matishov, G and Voskoboynikov, G.	Look and think (Russian)	a	Severnyye Prostory	1991, 46	unavail.	5-11	Summary: Addresses threat to ecology of Barents Sea as result of man's activities: fishing, shipping, seismic surveys for oil; and gas exploration, local waste disposal, atmospheric pollution and contaminated water from Gulfstream. Details various accidents since 1961, also dumping of nuclear reactors, which have contributed to pollution. Depicts some flora and fauna of seabed.	perio dical	SPRI	U
50	McDougall,	The eventful voyage of H.M.	a	Longman, Brown,	1857	London	530	Summary: Expedition of Henry Kellet, 1852-54, and ship's subsequent	book	SPRI Shelf(*41):91(08)[1852-	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
	George Frederick	discovery ship "Resolute" to the Arctic regions in search of Sir John Franklin and the missing crews of H.M. discovery ships "Erebus" and "Terror", 1852, 1853, and 1854. To which is added an account of her being fallen in with an American whaler after her abandonment in Barrow Straits, and her presentation to Queen Victoria by the Government of the United States.		Green, Longmans, & Roberts.				history following abandonment.		54]	
594	Mendiola, Achutegui, & De la Rosa	Fire Ranks Second in Maritime Casualties	a	FireNet (Maritime)	unavail.	unavail.	unavail.	.	.	USCG	U
125	Mogridge, G.R.; Pratte, B.D. and Jamieson, W.W.	Hydrodynamic model study of the semi-submersible "Ocean Ranger". In: Chung, Jin S.; Yoshida, K.; Sparks, C.P. and Tsahalis, D.T., eds. Proceedings of the Fifth International Offshore Mechanics and Arctic Engineering (OMAE) Symposium presented at the Fifth (1986) International Symposium & Exhibit on Offshore Mechanics and Arctic Engineering (OMAE), Tokyo, Japan, April 13-18, 1986... Vol. 3.	a	American Society of Mechanical Engineers.	1986	New York	1-8	Summary: Hydrodynamic model study of the semi-submersible "Ocean Ranger" which capsized in 1982 and the conclusions reached as to the cause of the disaster.	book	SPRI Shelf (*60):62	U
22	Moscow News	Moscow News	a	Moscow News	1997	Moscow	1997, 38:3	Summary: Reports another mine explosion in Barentsburg; 13 died. Consul ascribes tragedy to out-of-date equipment, particularly ventilation system. Explosion was caused by methane or coal dust	news article	SPRI	U
126	Moshaivov, A. and Steinhilber, M. R.	Theoretical assessment of light structural damage due to ship collision with ice. In: Sodhi, Devinder S.; Luk, C. H. and Sinha, Nirmal K., eds. OMAE 1988 Houston. Proceedings of the Seventh International conference on Offshore Mechanics and Arctic Engineering. ... presented at... Houston, Texas. Feb. 7-12, 1988. Vol. 4. Arctic engineering and technology.	a	American Society of Mechanical Engineers.	1988	New York	221-227	Summary: In order to estimate strength required for ships' hulls, plasticity methods are used in conjunction with given design ice loads. In this paper, new plasticity model is suggested, based on the assumption that kinetic energy is absorbed both by ice and structure. Energy absorbed by ice is significant in reducing predicted permanent deflection of ship's plating.	book	SPRI Shelf (*60):62	U
127	Moshaivov, A. and Steinhilber, M. R.	Theoretical assessment of light structural damage due to ship collision with ice.	a	Journal of Offshore Mechanics and Arctic Engineering	1991, 113(1)	unavail.	61-66	Summary: In order to estimate strength required for ships' hulls, plasticity methods are used in conjunction with given design ice loads. In this paper, new plasticity model is suggested, based on the assumption that kinetic energy is absorbed both by ice and structure. Energy absorbed by ice is significant in reducing predicted permanent deflection of ship's plating.	periodical	SPRI	U
128	Munch, Jens Storm.	Querini on Rost. (Norwegian)	a	Ottar	1974, 78-80	unavail.	37-43	Summary: Account of shipwreck of Italian nobleman Pietro Querini on Rost, north Norway, in 1432. Includes extracts from Querini's own account, translated into Norwegian, and also from that of two members of the crew, Christafalo Floravante and Nicolo de Michiele.	periodical	SPRI	U
51	National	Grounding of the U.S. Tankship	a	National Transportation	1990	Washington,	255	Summary: Official investigation into cause of grounding. Includes	book	SPRI	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
	Transportation Safety Board	Exxon Valdez on Bligh Reef, Prince William Sound near Valdez, Alaska, March 24, 1989. Marine accident report.		Safety Board		D.C.		detailed discussion of safety issues involved and recommendations for future action.		Shelf(*49):504.054(204):665.6	
197	OREDA	OREDA Offshore reliability data handbook 1st edition.	a	OREDA Participants	1984	Norway	386	Summary: Purpose of handbook: The handbook was developed in order to enhance safety and reliability/availability studies of offshore systems by providing a sound base of generic reliability data gathered from maintenance systems, test records, operational logbooks and other technical information systems. The handbook should provide a basis for further data collection and analysis within each participating company. The data published in this handbook also provides a unique source of authenticated data for many other areas of interest, e.g. design audits, maintenance planning, safety system testing, plant availability and cost-benefit studies.	book	Bercha	U
198	OREDA	OREDA-92 handbook 2nd edition offshore reliability data.	a	OREDA Participants	1992	Norway	unavail.	Summary: The OREDA-92 handbook will give a unique data source on failure rates, failure mode distribution and repair times for equipment used in offshore development. These data are necessary for reliability as well as risk analyses. Possible applications are: reliability, availability, and maintainability (RAM) analyses and regularity studies, risk analyses, planning and scheduling of maintenance, inspection and testing, cost benefit studies and selection of alternative system designs.	book	Bercha	U
609	Pate-Cornell, E.	Managing fire risk onboard offshore platforms: Lessons form Piper Alpha and probabilistic assessment of risk reduction measures.	a	Fire Technology	1995	unavail.	unavail.	.	journal	USCG	U
533	Primatech, Inc	Primatech's PSMOffice V2.1	a	Primatech Inc	unavail.	World Wide Web	unavail.	Summary: Primatech develops and licenses computer software packages for process safety and risk management applications. These programs can help you identify, evaluate and manage process hazards. Software available: AUDITWorks VI, PHAWorks V4.1 and PSMSource.	software	Primatech	U
621	Ramachandran, G.	Probabilistic approach to fire risk evaluation.	a	Fire Technology	1988	unavail.	unavail.	.	journal	USCG	U
642	Ramachandran, G.	Kingdom.	a	in: Fire Safety Science and Engineering, T.Z. Harmathy (ed.)	1985	unavail.	unavail.	.	book	USCG	U
135	Richarson, Michael.	Strategic tensions simmer.	a	Pacific Defense Reporter	1987, July	unavail.	10-12	Summary: Discusses potential strategic importance of Antarctica in context of development of minerals and other natural resources. Comments on South Africa's plans for airstrip and possible nuclear tests on Marion Island, and rumours of French proposals to use Kerguelen of St Paul Islands as replacement nuclear test site for Mururoa atoll and mysterious sinking of Panamanian registered trawler off St Paul. Reports on CRAMRA negotiations and role of Antarctic and Southern Ocean Coalition.	periodical	SPRI Pam (*7):35	U
647	Robinson, A.	The Scandinavian Star incident.	a	Firenet (Maritime)	unavail.	unavail.	unavail.	.	journal	USCG	U
53	Rodionoov, N and Vorob'yev, V	The safety of the nuclear power plant of the Sevmorput. (Russian)	a	Morskoy Flot	1989, 11	unavail.	36-38	Summary: Continuation: part 1 of article in Morskoy Flot 1989 (10). Discusses technical safety aspects of nuclear power plant lighter Sevmorput' with reference to technical drawings.	periodical	SPRI	U
54	Rodionoov, N and Vorob'yev, V	The safety of the nuclear power plant of the Sevmorput. (Russian)	a	Morskoy Flot	1989, 10	unavail.	32-35	Summary: Describes specifications and discusses technical safety aspects of nuclear power plant lighter Sevmorput' with reference to technical drawings. Part 2 of article in Morskoy Flot 1989 (11).	periodical	SPRI	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
628	Runyan, Bangdiwala, Linzer, Sacks and Butts.	Risk factors for fatal residential fires.	a	Fire Technology	1993	unavail.	unavail.	.	journal	USCG	U
574	Sinclair, C.A.	Causes of Fires in Ships	a	unavail.	1972	unavail.	unavail.	.	.	USCG	U
625	Smith, R.	Risk analysis for the safety of airline passengers.	a	unavail.	unavail.	unavail.	unavail.	.	book	USCG	U
479	Society of International Gas Tanker and Terminal Operators Ltd (SIGTTO)	Accident prevention : The use of hose and hard-arms at marine terminals handling liquefied gas. 2nd ed.	a	SIGTTO	1996 Information paper No. 4	London	unavail.	.	book	IMO Library ISBN 1-85609-114-7	U
56	Stevenson, Alex.	A postscript on H.M.S. Resolute.	a	North, 16 (6)	1969, 6	unavail.	21-24	Summary: Abandonment of Resolute in 1854 during Sir Edward Belcher's expedition in search of Franklin; her recovery and subsequent history until she was broken up in 1880.	periodical	SPRI	U
632	Still, G.K.	Design.	a	in: Fire Safety on Ships: Developments into the 21st Century.	1994	unavail.	unavail.	.	book	USCG	U
531	TA&R Program	International workshop on marine pipeline safety assessment and risk management. University of California at Berkley, spring 1998.	a	MMS	unavail.	Herndon, VA	unavail.	Summary: The workshop was designed to bring together industry, government, and the scientific community to discuss the strengths and weakness of the various approaches to pipeline safety assessment and risk management. A further objective of the workshop was to identify research and development efforts that are needed to improve the safest, inspection, and maintenance of offshore pipelines.	workshop proceedings	MMS Project 282	U
151	Tambobskiy, K and Suslin, M.	Anatomy of accidents. (Russian)	a	Morskoy Flot	1990, 10	unavail.	14-15	Summary: Excmines nature of shipping accidents on Northern Sea Route since 1969 and analyzes causes. Mentions examples of accidents and notes considerable increase in accidents in autumn and winter periods.	periodical	SPRI	U
152	Taylor, Eva G.R.	Shipwrecked in Arctic in 1432.	a	Geographical Magazine	1963, 36(7)	unavail.	377-383	Summary: Account of tracking expedition led by Venetian Piero Quirino in ship wrecked off western Ireland; drift of survivors to Lofoten islands, north Norway.	periodical	SPRI	U
153	Teplyakov, Yuriy.	Black April.	a	Moscow News	1992, 49	unavail.	:9	Summary: Report on sinking of Komsomolets nuclear powered submarine which sank in Norwegian Sea in April 1989. Discusses potential dangers from corrosion of its nuclear reactors and torpedoes with nuclear warheads.	periodical	SPRI	U
482	The Waterfront Conference Company	Marine disaster response : Learning from the past - Looking to the future : Conference papers 16 October 1996 : London)	a	The Waterfront Conference Company	1996	London	unavail.	.	conference proceedings	IMO Library	U
637	Thompson, P.A. and Marchant,E. W.	Testing and application of the computer model "SIMULEX".	a	Fire Safety Journal	1995	unavail.	unavail.	.	journal	USCG	U
150	Tmamam, Hiroshi.	Oil spilling from a grounded mid-deck tanker.	a	INSROP Working Paper	1998, 115	unavail.	1-18	Summary: Discusses issue of oil spilling from ship hull with mid-deck, expected to be in service for NSR in future. Japanese design for double hull examined, preventing oil outflow even in high-impact	periodical	SPRI	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
								grounding and collisions and thus satisfying requirements for NSR oil tanker design. Sub- Programme I. Project I.5.4. Behavior and characteristics of spilling oil.			
550	Transportation Safety Board of Canada	TSB statistical summary: marine occurrences	a	Transportation Safety Board of Canada	1990	Hull, QB	unavail.	.	book	UofC VK200 .R47 NO.SM9501	U
154	Tsoy, L; Volkov, V.; Karavanov, S; Moraynis, F. and Zubkova, A.	Environmental and structural safety of ships.	a	INSROP Working Paper	1996, 70	unavail.	1-55	Summary: INSROP Sub-Programme II: Environmental Factors. Final report of "Requirements for Ecological and Structural Ship Safety". Considers two types of pollution from tankers: operational pollution during transportation and cargo handling, and accidental pollution caused by hull damage. Gives statistics for observed damage at different locations and devises equations to estimate expected oil outflow with a given collision. Suggests use of doubles hulls as solution for reducing risk.	periodical	SPRI	U
456	UKOOA	Industry issues health and safety Piper Alpha. Appendix I - industry initial report.	a	United Kingdom Offshore Operators Association (UKOOA)	1999	UK	unavail.	Summary: In regards to the Piper Alpha incident, this Industry Initial Report Appendix I covers the essential features of permit to work systems. Essential features of the system are: a) Clear identification of who may authorize particular jobs and who is responsible for specifying the necessary precautions; b) Training and instruction in the issue and use of permits; c) Monitoring and auditing to ensure that the system works as intended and to seek improvement. Appendix II covers accident frequency rates. Appendix III summarizes offshore hydrocarbon releases and Appendix IV focuses on all industry rates - by industry.	report	UKOOA	U
457	UKOOA	United Kingdom Offshore Operators health and safety - Piper Alpha- a briefing.	a	United Kingdom Offshore Operators Association (UKOOA)	1999	UK	6	Summary: UKOOA provides a briefing on the Piper Alpha incident including response from industry and the effect that new safety guidelines have had on gas exploration and production.	report	UKOOA	U
157	United States. Navy. Hydrographic Office.	The Titanic - 50 years later.	a	Navy Hydrographic Office.	1962	Washington, D.C.	unpaged	Summary: Brief account of Titanic disaster. Outlines techniques of iceberg detection and destruction.	book	SPRI Pam(*61):551.326.6	U
159	Vairo, Carlos Pedro.	Ushuaia (Spanish and English).	a	Zagie & Urruty	1998	Ushuaia, Argentina	224	Summary: History of Ushuaia from discovery of Beagle Channel to 1970's, based on impressions of visitors, prisoners, and long-term residents. Includes descriptions of Yahgan people and life style; role of missionaries; daily life of early settlers; history of civilian and military prison; shipwrecks; economic development and architecture.	book	SPRI Shelf (829.0):711.42(2)[Ushuaia]	U
160	Vaughan, H. and Asadi, G. Vaez.	The dynamics, flexural response, and damage of ships in ice. In: Murthy, Thiruvalem K.S.; Paren, Julia G.; Sackinger, William M. and Wadhams, peter, eds. Ice technology for polar operations. Proceedings of the Second International Conference on Ice Technology, held at Downing College, Cambridge University, UK, during 18-20 September 1990.	a	Computational Mechanics Publications.	1990	Southampton	133-144	Summary: Discusses some results of analytic/numerical investigation made into dynamics of large Ships which are involved in ice or grounding collisions and in which damage and loss of steerage occurs.	book	SPRI Shelf 551.326	U
161	Villiars, Alan John.	Posted missing. The story of ships lost without trace in recent years.	a	Hodder and Stoughton	1956	London	256	Summary: Includes loss of Hull trawlers Lorella and Roderigo due to icing north of Iceland, January 1955 (p.93-114); five Norwegian sealing vessels lost in Greenland Sea, April 1952 (p.117-135); Kobenhaven lost in 1928 or 1929 (p.169-184); Waratah lost in July 1909 (p.142-	book	SPRI Shelf 656.608.5	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
								160); with information on search expeditions for last two vessels at sub-Antarctic islands.			
650	Watt, J.M.	Validating fire models.	a	Fire Technology	1987	unavail.	unavail.	.	journal	USCG	U
597	Watts, J.M.	Fire Risk Ranking	a	Fire Technology	1991	unavail.	unavail.	.	journal	USCG	U
319	WEMT'91	Offshore operations post Piper Alpha : London, 6-8 February 1991 / WEMT'91 ; organized and sponsored by the Institute of Marine Engineers in association with the Royal Institution of Naval Architects.	a	Marine Management (Holdings) Limited	1991	London	unavail.	.	conference proceedings	NEB TN 871.3/W4/1991	U
163	Wilson, J. C.	Meteorological factors associated with the besetment of the M.V. Nella Dan off the Antarctic coast, October 1985. In: American Meteorological Society. Second International Conference on Southern Hemisphere Meteorology, December 1-5, 1986 Wellington, New Zealand.	a	American Meteorological Society.	1986	Boston, MA.	129-129	Summary: As well as Nella Dan, M.V. John Briscoe was trapped by ice during this period, and ice-strengthened trawler Southern Quest went down. Post-analysis of meteorological conditions, associated with trapping of Nella Dan off coast of Enderby Land, for seven weeks from late October to early December 1985 was conducted to identify factors contributing to initial besetment and its longevity. Points out effect of strong winds and large amplitude swell on motion of sea ice.	book	SPRI Shelf (*7):551.5	U
222	WOAD	WOAD statistical report 1996 : statistics on accidents to offshore units engaged in oil and gas activities worldwide in the period 1970-95.	a	Det Norske Veritas AS	1996	Norway	unavail.	Subjects: Offshore structures - accidents - Statistics Marine Accidents - Statistics.	report	NEB TC1665/W62/1996	U
58	Yakovets, D.	Diesel-electric ship Yenisey refloated and taken in tow. (Russian)	a	Morskoy Flot	1964, 4	unavail.	21-22	Summary: Incident in Chukchi Sea, September 1964.	periodical	SPRI	U
164	Yakovets, D.	Diesel-electric ship Yenisey refloated and taken in tow. (Russian)	a	Morskoy Flot	1964, 4	unavail.	21-22	Summary: Incident in Chukchi Sea, September 1964.	periodical	SPRI	U
166	Yamamoto, K.	On the relation between ship accidents by the sea ice and meteorological conditions. (Japanese)	a	Journal of Meteorological Research.	1984, 36(20	Tokyo	57-64	Summary: Accidents in Sea of Okhotsk and around coast of Hokkaido.	periodical	SPRI	U
165	Yamamoto, K.	On the relation between ship accidents by the sea ice and meteorological conditions. (Japanese)	a	Marine Meteorological Report.	1984, 39	Hakodate Marine Observatory	42-51	Summary: Accidents in Sea of Okhotsk and around coast of Hokkaido.	periodical	SPRI	U
167	Yeltsov, A.P.	Current sea navigation safety and injury rates in the [fishing] industry. (Russian)	a	Rybnoye Khozyaystvo	1990, 8	unavail.	3-6	Summary: discusses accident rate in Soviet fishing industry with particular reference to Far East fishing fleet, subject of "especially serious situation" (35.6% of all fishing industry's accidents). Includes shore workers. Analyzes types of accidents and discusses relevant legislation.	periodical	SPRI	U
323	.	Interannual variability of climate of the Canadian east coast.	ea	Atmospheric Environment Service	1986	Ontario	unavail.	.	book	NEB QC 980.15/C3/no.86-17	U
328	.	Climatology of the east coast marine areas.	ea	Atmospheric Environment Service	1989	Ottawa	unavail.	.	book	NEB QC980.15/C3/no.84-14	U
280	.	Bibliography of environmental studies by industry in areas of the	ea	Canada Oil and Gas Lands Administration	1988	Ottawa	unavail.	.	bibliograph	NEB TD195/.05/C3	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
		Canadian offshore 1964-1987							y		
242	.	Offshore petroleum directory.	ea	Dept. of Industry, Trade and Technology	unavail.	St. John's, Nfld.	unavail.	.	directory	NEB HD9574/.C3/034/REF	U
271	.	Federal offshore statistics : leasing, exploration, production, revenue.	ea	Dept. of the Interior	unavail.	Washington, D.C.	unavail.	.	statistics	NEB HD9560.4/08	U
275	.	Arctic offshore gravity structures : a reference manual.	ea	Energy, Mines and Resources Canada	1986?	Ottawa	unavail.	.	manual	NEB TC1665/A73	U
260	.	A Technology-based industry and the Canadian government offshore oil and gas as a case study.	ea	Environment Canada	1985	Ottawa	unavail.	.	case study	NEB TN871.3/T4	U
239	.	Motion and impact of icebergs : development of a model to predict ice mass motions in the vicinity of an offshore structure.	ea	Environmental Studies Revolving Funds	1986	Ottawa	unavail.	.	book	NEB HC120/.E5/E52/no.044	U
332	.	Public information on oil and gas activities : an assessment of current and future strategies for Canada's east coast offshore.	ea	Environmental Studies Revolving Funds	1986	Ottawa	unavail.	.	book	NEB HC120/>E5/E52/no.047	U
250	.	Special report on Hibernia offshore Newfoundland, 1989-2012.	ea	Ian M. Doig & Associates Ltd.	1988, Fall	Calgary, Alberta	unavail.	Subjects: Hibernia (Oil field) Offshore oil industry - Newfoundland	book	NEB TD194.5/H53	U
261	.	Motion and impact of icebergs : development of a model to predict ice mass motions in the vicinity of an offshore structure.	ea	Micromedia Limited	1997	Toronto, Ontario	unavail.	.	Mfiche	NEB HC120/.E5/E52/no.044	U
268	.	Public information on oil and gas activities : an assessment of current and future strategies for Canada's east coast offshore.	ea	Micromedia Limited	1997	Toronto, Ontario	unavail.	.	Mfiche	NEB HC120/.E5/E52/no.047	U
281	.	Comparison of major construction projects and offshore hydrocarbon developments in Atlantic Canada/ Gardner Pinfold Economists Limited and Atlantic Consulting Economists Limited.	ea	Micromedia Limited	1997	Toronto, Ontario	unavail.	Subjects: Offshore oil industry - Atlantic coast (Canada) Offshore gas industry - Atlantic coast (Canada)	Mfiche	NEB HC120/.E5/no.015/Mfiche	U
326	.	Design of an iceberg scour repetitive mapping network for the Canadian east coast.	ea	Micromedia Limited	1997	Ontario	unavail.	.	Mfiche	NEB HC120/.E5/no.043/Mfiche	U
330	.	Local business adaptation to east coast offshore energy development.	ea	Micromedia Limited	1997	Ontario	unavail.	.	Mfiche	NEB HC120/.E5/E52/no.071/Mfiche	U
249	.	Hibernia frontier : people, pioneering, offshore, excellence.	ea	Milestone Publications Inc.	unavail.	St. John's, Nfld.	unavail.	Subjects: Hibernia (Oil field) - Periodicals	periodical	NEB	U
259	.	An assessment of techniques for removing offshore structures.	ea	National Academy Press	1996	Washington, D.C.	unavail.	.	book	NEB TC1665/A87	U
286	.	Frontier transportation : ... brief to the Special Committee of the Senate on the Northern Pipeline respecting offshore transportation study, September 1982	ea	NEB	1982	Ottawa	unavail.	.	study	NEB HD9574.6/.C3/C362	U
298	.	Offshore waste treatment guidelines.	ea	NEB	1996	Calgary, Alberta	unavail.	.	guide	NEB TD899/.P4/G8/1996	U
333	.	East coast Canada map.	ea	Oilweek	1997	Calgary, Alberta	unavail.	Summary: Map of East Coast of Canada.	map	NEB V.F. Maps - Oil Fields - Canada	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
252	.	Offshore platforms and pipelining.	ea	Petroleum Publishing Company	1976	Tulsa, Okla.	unavail.	.	book	NEB TN871.3/032	U
403	.	Search and rescue - east coast facilities - report of statement by Minister (in Hansard for Thursday, February 2, 1984)	ea	unavail.	1984	unavail.	unavail.	.	report	C-NOPB VK1326N6 1984	U
313	Akenhead, S.A.	Ocean climate and the marine fisheries of Atlantic Canada : an assessment.	ea	Bedford Institute of Oceanography	1981	Dartmouth, Nova Scotia	unavail.	.	Mfiche	NEB GC1/B43/no.81-8/Mfiche	U
60	Alfultis, Michael A.	Looking for icebergs.	ea	Mariners Weather Log	1989, 33(2)	unavail.	2-7	Summary: Article describing activities of US coast Guard's International Ice Patrol in North Atlantic. Began in 1912 with sinking of RMS Titanic. Includes table of IIP broadcast stations, times, frequencies, and notice relating to Titanic Historical Society.	article	SPRI Pam 061(100)[International ice Patrol]	U
227	American Petroleum Institute.	Draft bulletin on the design of windless wildcats for floating offshore structures.	ea	American Petroleum Institute	1988	Washington, D.C.	unavail.	Summary: Draft bulletin on the design of windlass wildcats for floating offshore structures.	bulletin	NEB API/Bull/2S1988	U
234	American Petroleum Institute.	Draft recommended practice for planning, designing and constructing fixed offshore platforms : load resistance factor design.	ea	American Petroleum Institute	1989	Washington, D.C.	unavail.	.	report	NEB API/RP/2a-lrfd/1989	U
325	Birdsall, Allan.	Effects monitoring strategies and programs for Canada's east coast.	ea	Environmental Studies Revolving Funds	1985	Ottawa	unavail.	.	book	NEBHC120/.E5/E52/no.005	U
322	Bowyer, Peter J.; Gray, John M.	East coast marine weather manual : a guide to local forecasts and conditions.	ea	Environment Canada Atlantic Region	1989	Bedford, NS	unavail.	.	book	NEB QC875/.C3/B69	U
329	Brown, Ross D.	Impacts of global warming for Canadian east coast sea-ice and iceberg regimes over the next 50 to 100 years.	ea	Canadian Climate Centre	1993	Ontario	unavail.	.	book	NEB QC981.8/C5/C55/no.93-03	U
233	Clarke, Elizabeth E.; Baker, Karen A.	Design of offshore structures for Canadian frontiers : proceedings of a symposium held at the University of Western Ontario, London, Ontario, November 1987.	ea	Centre for Frontier Engineering Research	1987	Edmonton, Alberta	unavail.	.	symposium proceedings	NEB TC1665/D45	U
265	Cotterill, Ewan.	Offshore hydrocarbon exploration : report / West Coast Exploration Environmental Assessment Panel.	ea	Environment Canada	1986	Ottawa	unavail.	.	report	NEB TN871.3/03	U
229	Dakers, Sonya.	East coast offshore oil and gas development.	ea	Library of Parliament	1989	Ottawa	unavail.	.	book	NEB HD9574/.C32/D3	U
269	Gardner, Michael.	Comparison of major construction projects and offshore hydrocarbon developments in Atlantic Canada/ Gardner Pinfold Economists Limited and Atlantic Consulting Economists Limited.	ea	Environmental Studies Revolving Funds	1985	Ottawa	86	Summary: Offshore oil and gas development will involve the construction of onshore facilities, as well as the onshore construction of structures for installation offshore. These activities will generate substantial levels of employment and may have significant impacts on communities in the Atlantic Provinces. The nature and magnitude of these potential impacts are not well understood by the majority of people in the region. This is due in part to the general mystique surrounding offshore development, and in part to the limited access most people have to meaningful information about specific offshore projects. It is due also to the absence of any frame of reference for	report	NEB HC120/.E5/E52/no.015	U

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								assessing the scale and implications of these projects. This report is an attempt to provide just such a frame of reference. It contains a body of data allowing direct comparisons to be made among recent major construction projects familiar to residents of the Atlantic Provinces and the proposed Venture and Hibernia offshore developments. Included in the comparative data considered relevant for developing the frame of reference are project schedules, capital costs, employment requirements, and social impacts. The report also contains descriptive profiles of each of the projects.			
296	Gowan, Ann M.; Goetz, M.J.; Waitsman, I.M.	Choosing offshore pipeline routes : problems and solutions.	ea	Industrial Environmental Research Lab.	1980	Cincinnati, Ohio	unavail.	.	Mfiche	NEB TN879.5/G68/Mfiche	U
103	Howells, D.K.	The maiden voyage of the Titanic - a meteorological perspective.	ea	Weather	1992, 47(11)	unavail.	417-423	Summary: Discusses meteorological conditions on route of liner, which sank in North Atlantic after colliding with iceberg on 15 April 1912.	periodical	SPRI	U
337	Lewis, P. J.	Severe storms over the Canadian western high Arctic : a catalogue summary for the period 1957 to 1983	ea	Atmospheric Environment Service	1987	Ontario	unavail.	.	book	NEB QC980.15/C3/no.87-2	U
335	Lewis, P. J.; Moran M.D.	Severe storms off Canada's east coast : a catalogue summary for the period 1957 to 1983	ea	Atmospheric Environment Service	1987 3rd ed.	Ontario	unavail.	.	book	NEB QC980.15/C3no.84-13	U
324	Marko, J.R.	Implications of global warming for Canadian east coast sea-ice and icebergs regimes over the next 50 to 100 years.	ea	Atmospheric Environment Service	1991	Ontario	unavail.	.	book	NEB QC980.15/C3/no. 91-9	U
334	Mortsch, Linda D.	Marine climatological atlas : Canadian east coast.	ea	Atmospheric Environment Service	1985	Ontario	unavail.	Subject: Marine Climatological atlas	atlas	NEB QC980.15/C3/no.85-11	U
278	Mortsch, Linda D.; Kalnins, Ingrid I.	Bibliography pertinent to offshore energy exploration and development.	ea	Atmospheric Environment Service	1984	Ontario	unavail.	.	bibliography	NEB Z6972/M37	U
225	Nasseri, Touraj.	Proceedings of the Workshop on Design Environmental Loads for Offshore Exploration and Production Systems / sponsored by the Federal Panel on Energy Research & Development (PERD) and the Centre for Frontier Engineering Research.	ea	Federal panel on Energy R & D	1992	Canada	unavail.	.	workshop proceedings	NEB TC1665/W6/1991	U
226	NTIS	Offshore pipelines, 1964 - April 1982 : citations from the NTIS data base.	ea	NTIS	1982	Springfield, Va.	unavail.	.	Mfiche	NEB Z5853/.P5/04/Mfiche	U
770	Offshore Technology	Hibernia oil and gas field project.	ea	Offshore Technology	unavail.	Canada	5	Summary: This article is a brief overview of the Hibernia oil and gas field project.	world wide web	Offshore Technology	U
774	Offshore Technology	Sable Island gas field project	ea	Offshore Technology	unavail.	Canada	5	Summary: This article is a brief overview of the Sable Island gas field project.	world wide web	Offshore Technology	U
775	Offshore Technology	Terra Nova Petro-Canada oil field project- Grand Banks.	ea	Offshore Technology	unavail.	Canada	5	Summary: This article is a brief overview of the Terra Nova Petro-Canada oil field project of Newfoundland.	world wide	Offshore Technology	U

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327	Piper, D.J.W.	Submersible observations off the east coast of Canada.	ea	Geological Survey of Canada	1989	Ottawa	unavail.	.	book	NEB QE39/.C16/C16/no.88-20	U
137	Riska, Kaj.	Theoretical modelling of ice-structure interaction. In: Jones, Stephen J.; McKenna, Richard F.; Tillotson, Joy and Jordaan, Ian., eds. Ice-Structure Interaction. IUTAM/IAHR Symposium, St. John's Newfoundland Canada 1989.	ea	Springer-Verlag	1991	Berlin	595-618	Summary: Describes principles of theoretical analysis of structure-ice interaction, with salient processes considered n terms of structure motions, and in particular, penetration of structure into ice. Example of procedure is given by analyzing ship ramming into finite ice floe. Discussion, p. 617-618.	book	SPRI Shelf 624.145	U
256	Robinson, Terry.	The offshore : an introduction to the technology, terminology and operations of offshore oil exploration.	ea	Jesperson Press Ltd.	1992	St. John's, Nfld.	unavail.	.	book	NEB TN871.3/R62	U
331	Ross, D.J.; Lewis, C.M.F.; Bates, J.L.	East coast basin atlas series : Scotian shelf.	ea	Atlantic Geosciences Centre	1991	Nova Scotia	unavail.	.	book	NEB GC87.2/.S4/E27	U
148	Spears, K. Joseph.	Arctic marine risks - the interaction of marine insurance and Arctic shipping.	ea	Canadian Marine Transportation Centre	1986	Halifax, Nova Scotia	231	Summary: Examines risks and analyzes perceptions of risks by Canadian and foreign insurance markets. Note: Reported missing 2.6.98.	book	SPRI Shelf 656.6	U
232	Voyer, Roger D.	Offshore petroleum exploration on the Labrador continental shelf : a study of decision-making.	ea	Science Council of Canada	1975?	Ottawa	unavail.	.	book	NEB TN871.3/V69	U
228	Ward, C.H.; Bender, M.E.; Reish, D.J.	The offshore ecology investigation : effects of oil drilling and production in a coastal environment.	ea	William Marsh Rice University	1979	Houston, Tx.	unavail.	.	book	NEB 545/.05/04	U
660	Cooper, L.Y. and Stroup, D.W.	ASET - A Computer program for calculating available safe egress time.	eer	Fire Safety Journal	1985	unavail.	unavail.	.	journal	USCG	U
349	.	Safe evacuation of men during emergency abandonment of offshore installations: survival while awaiting rescue.	eer	.	1983	.	unavail.	.	book	C-NOPB VK1463 C7 1983	U
357	.	Conference proceedings for the latest developments in safe escape, evacuation and rescue from offshore installations - new responsibilities in the light of impending regulations.	eer	.	1992	.	unavail.	.	proceedings	C-NOPB VK1463L3 1992	U
374	.	Part 1 - integrated evacuation escape & rescue and part 2 - TOES TEMPSC Orientation and Evacuation System).	eer	.	unavail.	.	unavail.	.	book	C-NOPB VK1463E4	U
376	.	Evacuation Escape & Rescue Technical Advisory Group - lifeboat survival and rescue.	eer	.	1995	.	unavail.	.	book	C-NOPB VK1463M3 1995	U
382	.	Workshop: implementation of Lord Cullen's R&D recommendations concerning - evacuation, escape	eer	.	1996	.	unavail.	.	workshop	C-NOPB VK1463E933 1996	U

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		and rescue (EER).									
385	.	Conference proceedings - The First International Conference and Exhibition on Evacuation. Escape and Rescue Offshore - March 31-April 1, 1998, Aberdeen.	eer	.	1998	.	unavail.	.	conference proceedings	C-NOPB VK1463L31998	U
426	.	Conference proceedings for the latest developments in safe escape, evacuation and rescue from offshore installations - new responsibilities in the light of impending regulations.	eer	.	1992	.	unavail.	.	conference proceedings	C-NOPB VK1463L3 1992	U
445	.	Part 1 - integrated evacuation escape & rescue and part 2 - TOES (TEMPSC orientation and evacuation system).	eer	.	unavail.	.	unavail.	.	book	C-NOPB VK1463E4	U
449	.	GVA Von Tell Lifescape: collection of brochures, photos and documents on the GVA Von Tell escape system "Lifescape".	eer	.	1983	.	unavail.	.	brochures, photos, documents	C-NOPB VK1473 L48 1983	U
450	.	Conference proceedings for the latest developments in safe escape, evacuation and rescue from offshore installations - new responsibilities in the light of impending regulations.	eer	.	1992	.	unavail.	.	conference proceedings	C-NOPB VK1463L3 1992	U
708	.	Cutting the risk - and maybe the cost.	eer	Noroil	1989 Feb.	unavail.	unavail.	Subject: FFL, Gemevac, Flexitrans, Surescue, Skyscape.	periodical	DNV	U
406	.	Hearings on: marine safety and aids to navigation, search and rescue and enforcement of laws and treaties, marine environmental protection and Arctic research.	eer	unavail.	1981	unavail.	unavail.	.	book	C-NOPB VK1323C6 1981	U
409	.	Evaluation of emergency equipment and sea rescue techniques for use from mobile offshore drilling units in Canadian water.	eer	unavail.	1983	unavail.	unavail.	.	book	C-NOPB VK1463M3 1983	U
69	Anon.	USSR - USA: new maritime agreements.	eer	Soviet Shipping	1988, 8(3)	unavail.	:6	Summary: Agreement on establishment of joint "Chayka" and "Loran-C" radionavigation systems, which will greatly improve navigation accuracy in Sea of Okhotsk, in area of Kuril'skiye Ostrova and Kamchatka coast. Eastern "Chayka system to be combined with Aleutian "Loran-C" chain, with plan to set up joint three-station chain before 1990 comprising two Soviet stations (on Kamchatka and Sakhalin) and American unit on Aleutian island of Attu. Agreement on search and rescue at sea.	periodical	SPRI	U
692	Archer, S.	Tracking personnel in offshore emergencies.	eer	MIROS, IIR Conference	1992	Aberdeen	unavail.	.	paper	DNV	U
70	Argentina.	Survival on land and sea. (Spanish)	eer	Servico de Hidrografia	1961	Buenos Aires	235	Summary: Translation into Spanish of US Navy manual Survival on	book	SPRI Shelf 910.2(211)	U

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	Servico de Hidrografia Naval			a Naval				Land and Sea.			
689	Ballingall, B.	Currents developments in evacuation and escape.	eer	BP Exploration, IIR Conference	1992	Aberdeen	unavail.	.	paper	DNV	U
73	Baskin, Alexander; Buzuyev, Arkady and Yakshevich, Evgeny	Operational Aspects	eer	INSROP Working Paper	1995, 17	unavail.	1-133	Summary: Results of investigations of operational aspects of international sailing through Northern Sea Route: legislation, route planning, navigation, communications, infrastructure, crew training, vessel performance, ice accident, and search and rescue. Focuses on support of international shipping demands with regard to peculiarities of sailing in Russian Arctic.	periodical	SPRI	U
74	Baskin, Alexander; Buzuyev, Arkady and Yakshevich, Evgeny	Operational Aspects. Volume 2 - 1994 project work.	eer	INSROP Working Paper	1997	unavail.	variously paged	Summary: Continues 1993-94 investigations on operational aspects of sailing NSR: regulations, navigation and communications, safety of sailing, etc. Emphasis placed on ways to improve current techniques for support of sailing in Russian Arctic. Discusses hydrometeorological problems in context of operational aspects. Sub-programme I. Natural conditions and ice navigation. Project I.1.2 Operational aspects.	periodical	SPRI	U
8	Bercha, F.G. (President, Bercha Group); M.C. Cerovsek (Sr. Engineering Specialist, Bercha Group); A.C. Churcher (Consulting Naval Architect, Bercha Group, and President, Cautley Enterprises Inc.), & D.S. Williams (Safety Consultant, Sable Offshore Energy Project)	Escape, Evacuation, and Rescue Modeling for the Arctic Offshore	eer	Proceedings, RAO-99	1999	Russia, St. Petersburg	8	Summary: Model assessment of the reliability of proposed escape, evacuation, and rescue (EER) systems, particularly for unprecedented conditions such as the Arctic, is a vital part of safety management planning for new and modified installation. Although several models exist for ice-free EER systems, none appear to have been developed or published for Arctic offshore installations. This paper describes both network and Monte Carlo probabilistic simulation models for open water and Arctic EER simulations for Skyscape (chute) and TEMPSC (lifeboat) systems in partial ice cover locations off the East Coast of Canada, and certain novel systems in dynamic but 10/10 ice cover in the Eastern Russian Arctic. The effect on EER success probabilities of principal ice cover properties including ice thickness, ice fraction, and dynamics is illustrated. Conclusions and recommendations for the development of optimal systems are presented.	presented paper	Bercha W9910.1_	U
186	Bercha, F.G., Cerovsek, M.C., Churcher, A.C., and Williams, D.S.	Escape, Evacuation, and Rescue Modelling For the Arctic Offshore.	eer	Bercha Group	unavail.	Canada	8	Summary: This paper describes both network and Monte Carlo probabilistic simulation models for open water and Arctic EER simulations for Skyscape (chute) and TEMPSC (lifeboat) systems in partial ice cover locations off the East Coast of Canada, and certain novel systems of dynamic but 10/10 ice cover in Eastern Russian Arctic. The effect on EER success probabilities of principle ice cover properties including ice thickness, ice fraction, and dynamics is illustrated. Conclusions and recommendations for development of	paper	Bercha	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
								optimal systems are presented.			
34	Berezniy, V.	Icebreakers: fuel economy and navigation safety. (Russian)	eer	Morskoy Flot	1986, 5	unavail.	35-36	Summary: Shows that fuel economy of icebreaker increases with its load, and discusses corresponding 1986 recommendations for operation of icebreakers, taking variation in ice conditions into account. Suggests that some aspects of recommendations are not supported by practical experience, but concludes that potential savings are none the less great, suggesting more crew training and direct incentives to crews.	periodical	SPRI	U
35	Bogorodskiy, V.V. and Karpenko, V.	The Arctic: problems of shipping safety. (Russian)	eer	Morskoy Flot	1989, 5	unavail.	16-19	Summary: Discusses shipping safety along Northern Sea Route, with particular reference to hydrographic and cartographic support, and to navigational instruments. Mentions that safety work is allocated only two aging (1966 and 1967) icebreakers, and that other specialized vessels are also aging. recommends import of modern equipment and vessels.	periodical	SPRI	U
690	Brandie, E.	Evacuation, escape and rescue analysis : A company approach to new and existing platforms.	eer	Chevron, IIR Conference	1992	unavail.	unavail.	.	paper	DNV	U
688	Jullen, C.	Evacuation and rescue in the North Sea : A statistical perspective.	eer	Heriot Watt, IIR Conference	1992	Aberdeen	unavail.	.	paper	DNV	U
696	Burnup, R.	Screening tool for quantifying the success of lifeboat launch and rescue from fixed installations.	eer	SRD Oil and Gas, AEA Technology, IIR Conference	1992	Aberdeen	unavail.	.	paper	DNV	U
79	Canada. Royal Commission on the "Ocean Ranger" marine disaster.	Report two: Safety offshore eastern Canada.	eer	Ministry of Supply and Services	1985, 3vols.	St. John's, Newfoundland	308, 189, 196	Summary: Investigation into the possible causes of the loss of "Ocean Ranger" drilling rig in 1982 with recommendations for future improvements in design and planning and in safety precautions.	report	SPRI (*61):622.24	U
18	Christian Michelsen Research	News from CMR	eer	Christian Michelsen Research	1999, December	Bergen	4	corporate brochure	brochure	Bercha	U
220	Conference: WEMT'91	Offshore operations post Piper Alpha : London, 6-8 February 1991 / WEMT'91 ; organized and sponsored by Institute of Marine Engineers in association with the Royal Institution of Naval Architects.	eer	Marine Management (Holdings) Ltd.	1991	London	unavail.	Subjects: Offshore structures - Fire and fire prevention - Congresses Offshore structures - Safety measures - Congresses Offshore structures - Design and construction - Congresses	book	NEB TN 871.3/W4/1991	U
695	Cowie, P.	Considerations for satisfying the requirements of temporary safe refuge on offshore installations.	eer	Shell, IIR Conference	1992	Aberdeen	unavail.	.	paper	DNV	U
684	DNV	Evacuation and rescue means - strengths and weaknesses, important constraints and limitations. Report No. ARF/97A4.	eer	The Norwegian Directorate and The Norwegian Oil Industry Association	1997 Feb.03	unavail.	unavail.	.	report	DNV	U
525	Government of Canada	WHMIS education and training programs: Guidelines for employers, workers and regulatory agencies.	eer	Canadian Government Publishing	1993	Canada	61	Summary: WHMIS is the Workplace Hazardous Materials Information system. Developed by labour, industry, occupational safety and health regulatory agencies, and federal and provincial governments, WHMIS Education and Training Programs instruct employers and workers about potential hazards and appropriate measures to follow for a range	book	Government of Canada No.L393-1993E ISBN 0-660-14812-9	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
								of harmful products in the workplace. This informative guide will help you learn how to meet the needs of new employees or workers with learning difficulties; modify training for specific industries; monitor and evaluate programs once they have been set up; and find qualified instructors and consultants. (Labour Canada)			
562	Gow, H.B.F., and R.W. Kay	Emergency Planning for Industrial Hazards	eer	unavail.	1988	unavail.	unavail.	.	.	USCG	U
308	Hagen, Jan-Erik	Safety technology, emergency equipment and sea rescue techniques : PERD task 6.2 program evaluation workshop, St. John's Newfoundland, May 26-27, 1988.	eer	Canada Oil and Gas Lands Administration	1988	Ottawa	unavail.	Subjects: Offshore structures - Safety measures - Congresses Survival and emergency equipment - Congresses.	workshop proceedings	NEB TC1650/S34/1988	U
535	Hankinson, Geoff	Defining safety standards offshore.	eer	BG Technology Innovator	1998 issue 7	UK	1	Summary: The BG Technology Spadeadam facilities in Cumbria, northern England, offer offshore constructors and operators a comprehensive testing capability ranging from the investigation of offshore fires and explosions to the generation of cracks in pipes. Work at Spadeadam helps underpin BG's confidence in determining design codes in a wide range of industry sectors.	periodical	BGTech	U
694	Hashemi, K.	An innovative approach to escape and evacuation.	eer	ELF, IIR Conference	1992	Aberdeen	unavail.	.	paper	DNV	U
277	International Conference Safety Offshore Eastern Canada (1984 : St. John's, Newfoundland).	Working papers : International Conference Safety Offshore Eastern Canada, St. John's Newfoundland, August 21-23, 1984.	eer	Royal Commission on the Ocean Ranger Marine Disaster	1984	St. John's, Nfld.	unavail.	.	report	NEB TN 871.3/r67/1984	U
42	Ivanov. A.	Difficult to learn... (Russian)	eer	Morskoy Flot	1988, 6	unavail.	32-33	Summary: Describes training in emergency procedures in Northern fleet.	periodical	SPRI	U
199	Jensen, Stein B.; Ruud, Stian; and Ostby, Erik.	OREDA: A software tool and database for offshore systems reliability.	eer	OMAE/ ASME	1993, Vol.II	Norway	unavail.	Summary: This paper addresses the generalised (OREDA) software tool and gives some example of its application. The OREDA software and methodology are very well suited to establish specific databases for a wide range of equipment types. The software may be used for both establishing the new databases, for data collection work and for selection of data subset for further analyses.	periodical	Bercha	U
43	Kazakov, A.	An ice training-centre is necessary. (Russian)	eer	Morskoy Flot	1987, 5	unavail.	:33	Summary: Criticizes absence of ice training-centre for mariners. Argues establishment of such centers would increase shipping safety, especially on Northern Sea Route.	periodical	SPRI	U
580	Kelly, R.B.	Emergency Incident Preparedness	eer	unavail.	1989	unavail.	unavail.	.	.	USCG	U
581	Kipp, J.D., and M.E. Loflin	Emergency Incident Risk Management	eer	unavail.	1996	unavail.	unavail.	.	.	USCG	U
528	Minerals Management Service (MMS)	Operational Safety and Engineering Research (AS&ER) Program.	eer	MMS	unavail.	Herndon, VA	2	Summary: OS&ER Program activities address technological issues associated with the complete spectrum of operations ranging from drilling of exploratory wells to removal and decommissioning of platforms and related production facilities.	internet	MMS	U
504	Moxie Media	Liferaft operation and survival	eer	Moxie Media Inc.	unavail.	New Orleans,	unavail.	Summary: Techniques such as working the painter to inflate the raft,	video	Moxie Media Inc.	For

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
	Inc.	practices.				LA		righting the raft, patching leaks, use of pyrotechnics to signal help, setting the sea anchor, closing down exits to maintain seaworthiness, passing out seasickness pills and provisions, and bolstering morale are all demonstrated. (20 mins.)			Sale
506	Moxie Media Inc.	Orientation and safety for the offshore oil industry.	eer	Moxie Media Inc.	unavail.	New Orleans, LA	unavail.	Summary: Available in English, Portuguese and Spanish. Employees new to the offshore oil industry need to keep abreast of the latest developments and safety requirements. From the North Sea to the Gulf of Mexico, to Arctic Seas, this video explores in depth the ever-changing role of oil and service company personnel and equipment. (43min)	video	Moxie Media Inc Off-OrientSafe	For Sale
522	Moxie Media Inc.	Hazard and risk evaluation.	eer	Moxie Media Inc.	unavail.	New Orleans, LA	unavail.	Summary: How to determine response objectives; sources for hazard information; how to evaluate risks; the importance of maintaining an attitude of safety and responsibility. Risk factors are outlined, air-monitoring instruments are studied and a basic understanding of how hazmats and their containers behave is provided. (25 min)	video	Moxie Media Inc EFG-Haz5Step3	For Sale
10	National Research Council of Canada - *Institute for* Marine Dynamics	Workshop on Escape, Evacuation and Rescue in the Offshore Industry	eer	National Research Council of Canada, Institute for Marine Dynamics	1999, June 17 & 18	Canada, Newfoundland, St. John's	122	Summary: A "Workshop on Escape, Evacuation, and Rescue in the Offshore Industry" was held at the Memorial University of Newfoundland on June 17th and 18th, 1999. The workshop was sponsored by the Institute for Marine Dynamics (MID), National Research Council (NCR) in response to a proposal for a research program that would be funded jointly by the National Resources Canada, Transport Canada, Canadian Association of Petroleum Producers, and the National Research Council. The workshop was organized as a forum in which to garner input from the stakeholders in the offshore industry, (...). The primary objective of the workshop was to identify the safety issues in Escape, Evacuation, and Rescue (EER) in the offshore industry. These issues would then be used in the development of a research program that should lead to the improvement of safety, and provide the groundwork for the development of performance standards for offshore EER.	workshop proceedings	Bercha	U
130	Natural Environment Research Council.	Guidance notes for safety in marine operations.	eer	Natural Environment Research Council.	1989	Swindon	74	Summary: Official handbook	book	SPRI Shelf 910.2:614.80	U
13	Normanns Kunstforlag A/S	FRAM	eer	Haslum Grafisk A/S	1999	Norway	44	Summary: This publication is from the Fram Museet, Bygdoy, Oslo. FRAM...is "the world's sturdiest vessel" which, in its time, sailed to both the northernmost and the southernmost points of the globe. It was built by Colin Archer and launched on 26 October 1892.	book	Bercha	U
459	Offshore Safety Division (OSD) at HSE.	Offshore research and development programme 1997 project handbook.	eer	HSE	1997	UK	4	Summary: The Offshore Safety Division of the Health and Safety Executive has responsibility for research and development on offshore safety. The R&D programme is undertaken to support HSE's regulatory responsibility for the safety of the offshore workforce and installations, and therefore has a broad technical scope ranging from 'Collisions' to 'Wells and Well Operations.' A project handbook for this research has been published, and is available from HSE Books, PO Box 1999. Sudburt, Suffolk CO106FS Tel: 017887 881165 Fax: 01787 313995.	book	OSD Information Centre, HSE	U
765	Offshore Technology	Hell Hansen Spesialprodukter AS - Diving and Survival Suits.	eer	Offshore Technology	unavail.	Norway	3	Summary: Helly Hansen Spesialprodukter AS has supplied the offshore industry with the ultimate in survival suits for almost 20 years. Through our factory in Moss Norway and our MoD approved facility in Oban Scotland we produce the following range of products: Survival suits, FCO Rescueman Suit, different dry suits and diving suits with other brand names, such as Scubapro, Scan Mod., and Nemo Classic, rescue vests.	world wide web	Helly Hansen	U

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786	Offshore Technology	Multifabs Survival - Coldwater offshore survival suits.	eer	Offshore Technology	unavail.	Scotland	3	Summary: Multifabs Survival Limited is a manufacturer and supplier of specialist survival clothing systems for a variety of specialised applications within the offshore oil and gas industry, aviation companies and defense departments. Products include helicopter passenger/air crew survival and immersion suits.	world wide web	Multifabs Survival	U
745	Paterson, R.B. et al.	An investigation of liferaft performance and recovery systems in extreme seas.	eer	Escape, Evacuation & Rescue Conference, RINA	1996 Nov.	London	unavail.	.	conference proceedings	FTL	U
643	Robbert, Bornemann and Hansen.	The intelligent emergency system.	eer	in: Fire Safety on Ships: Developments into the 21st Century.	1994	unavail.	unavail.	.	book	USCG	U
686	Robinson, P.	Requirements for escape, evacuation and rescue analysis.	eer	IIR Conference	1992	Aberdeen	unavail.	.	paper	DNV	U
644	Ross, J.S.	The management of safety: the role of safety cases and risk assessment.	eer	in: Fire Safety on Ships: Developments into the 21st Century.	1994	unavail.	unavail.	.	book	USCG	U
478	Royal Institution of Naval Architects (RINA)	Escape, evacuation and rescue : Design for the future : Proceedings-International Conference (19-20 November 1996)	eer	RINA	1996	London	unavail.	.	book	IMO Library ISBN 0-903055-24-4	U
138	RSFSR. Sovet Ministrov.	On measures for improving the protection of human life on internal bodies of water of the RSFSR and coastal sea areas. (Russian)	eer	Sobraniye Postanovleniy Pravitel'stva Rossiskoy Sovetskoy Federativnoy Sotsialisticheskoy Respubliki.	1988, 22,St.126	unavail.	418-422	Summary: Decree. Preamble criticizes Karel'skaya ASSR, Tyumenskay Oblast' and other regions. Paragraph 1 concerns establishment of specific areas for under-ice fishing and information on ice conditions for population.	periodical	SPRI	U
140	Semanov, G; Volkov, V.; Somkin, V. and Iljushenko-Krylov, D	Coastal pollution emergency plan Part 1.	eer	INSROP Working Paper	1997, 76	unavail.	1-28	Summary: INSROP Sub-programme II: Environmental factors. Based on IMO guidelines (International Meteorological Organization) for Emergency preparedness, describes concept of oil spill contingency plan for Northern Sea Route. Outlines Russian legislation relating to environmental protection and oil spills. Includes detailed table presenting means for combating oil spills.	periodical	SPRI	U
142	Shears, John R.	RSS James Clark Ross Shipboard oil pollution emergency plan.	eer	British Antarctic Survey.	1995	Cambridge	51	Summary: Lose-leaf binder regularly updated. Describes procedures to be used when an oil pollution incident has occurred or is likely to occur on board the James Clark Ross.	book	SPRI Shelf (*7):504.06	U
16	Simoes Re, Antonio J.	Workshop on escape, evacuation and rescue in the offshore oil industry	eer	IMD(NRC)	1999	Canada	unavail.	Summary: Workshop organized as a forum to garner input from the stakeholders, such as the operators, regulators, offshore petroleum boards, workers, manufacturers, consultants, and other interested parties. The primary objective of the workshop was to identify the safety issues in Escape, Evacuation and Rescue (EER) in the offshore industry. These issues will be used in the development of a research program that will lead to improvement of safety, and provide the groundwork for the development of performance standards for offshore EER.	research paper	IMD(NRC	U
691	Spouge, J.	Escape, evacuation and rescue from offshore installations.	eer	Technica, IIR Conference	1992	unavail.	unavail.	.	paper	DNV	U
608	Thompson, Vertinsky, Kira and	Performance of a regulatory agency as a function of its structure and client environment: A simulation	eer	Management Science	1982	unavail.	unavail.	.	journal	USCG	U

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	Scharpf.	study.									
187	Umoe Schat-Harding As.	Launching common standard European union conformity marking means big changes for type approval.	eer	Schat-Harding	1999	Norway	4	Corporate Brochure	brochure	Bercha	U
502	Videotel Marine International	See summary for a list of titles in this series.	eer	Videotel Marine International	unavail.	London	unavail.	Subjects: The following are a list of videos that deal with safety issues: Being prepared: Load line survey, Being prepared: Safety equipment survey, Cargo loss prevention on board bulk carriers, Keeping up standards: Ship vetting inspection for bulk oil carriers, Personal safety on bulk carriers, Personal safety in the galley, Personal safety on tankers, Personal safety on deck, Personal safety in the accommodation, Personal safety in the engine room, Setting a new course : An introduction to the revised STWC convention, and The shipboard management role.	video	IMO Library	U
687	Wallace, I.	UKOOA response to Cullen recommendations on evacuation, escape and rescue.	eer	Neste, IIR Conference	1992	Aberdeen	unavail.	.	paper	DNV	U
503	Walport International	See summary for a list of titles in this series.	eer	Walport International	unavail.	London	unavail.	Subjects: The following are a list of videos that deal with safety issues: Bunkering procedures : Don't take chances!, Emergency response : The vital first minutes, The ISM Code: What's it got to do with me?. Walport's Programme of personal safety ("POPS") : 35 awareness films to help to make ships and seafarers safer.	video	IMO Library	U
307	Yungblut, Glenn.	Safety technology, emergency equipment and sea rescue techniques : PERD task 6.2 program evaluation workshop, Halifax, Nova Scotia, June 18-19, 1986.	eer	Canada Oil and Gas Lands Administration	1986	Ottawa	unavail.	Subjects: Ocean engineering - Safety measures - Congresses ocean engineering - Equipment and supplies - Congresses Survival and emergency equipment - Congresses.	workshop proceedings	NEB TC 1650/S34/1986	U
446	.	OSR project: survival vest - evaluation of the Underwater Escape Rebreather (UESR) (intended to assist emergency egress from a downed and immersed helicopter).	es	.	1981	.	unavail.	.	book	C-NOPB VK1481U5S4 1981	U
447	.	United States Coast Guard emergency underwater escape rebreather evaluation.	es	.	1981	.	unavail.	.	book	C-NOPB VK1481 U5G7 1981	U
448	.	Assessment of the means for escape and survival in offshore exploration drilling operations.	es	.	1984	.	unavail.	.	book	C-NOPB VK1255O3R62 Escape 1984	U
452	.	Planning for the great escape: respiratory protection.	es	.	1990	.	unavail.	.	book	C-NOPB HD7275F5 1990	U
615	.	Operational analysis of the abandonment of merchant ships at sea.	es	.	1964	unavail.	unavail.	.	book	USCG	U
321	.	Marine anti-exposure work suit systems.	es	Atmospheric Environment Service	1986	Ontario	unavail.	.	book	NEB CAN/CGSB/65.21/1996	U
314	.	Marine abandonment immersion suit systems.	es	Canadian General Standards Board	1989	Ottawa	unavail.	Subject: Marine abandonment immersion suit systems.	standards	NEB CAN/CGSB/65.16/1989	U
272	.	Task and skill analysis of agencies regulating east Canada Offshore drilling.	es	National Petroleum Consultants Ltd.	1984	St. John's, Nfld.	unavail.	Subjects: Offshore oil industry - Canada - Safety measures Oil well drilling, Submarine - Canada - safety measures Drilling platforms - Canada - Safety measures Oil well drilling rigs - Canada - Safety	report	NEB TN871.3/R68	U

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								measures Offshore oil industry - Atlantic coast (Canada)			
705	.	Designers seek to ease the pain of escape.	es	Offshore	1996 May	unavail.	unavail.	Subject: Seascape, Telescape, Selantic, SJL Stairs.	periodical	DNV	U
709	.	Looking for a variety of platform escape methods.	es	Offshore Engineer	1988 Oct.	unavail.	unavail.	Subject: Surescue, LORS, PROD, Power.	periodical	DNV	U
706	.	Escape chute developed for platforms.	es	Oil & Gas Journal	1987 May	unavail.	unavail.	Subject: Skyscape.	periodical	DNV	U
710	.	British field opts for rescue escape system.	es	unavail.	19?	unavail.	unavail.	Subject: Skyscape.	periodical	DNV	U
76	Buxton, Ralph.	New cold water survival equipment. In; Ninth Annual Offshore Technology Conference.	es	Offshore Technology Conference	1977	Houston, texas	529-538	Summary: New cold water survival equipment (OTC 2669).	book	SPRI Pam 656.608	U
77	Cahill, Tim	Antarctic passages. In: Pecked to death by ducks.	es	Fourth Estate	1993	London	97-105	Summary: Fictionalized account of narrow escape from drowning during Antarctic cruise.	book	SPRI Pam 82-3[Cahill, Tim]	U
80	Canada. Survival Training School.	Down but not out.	es	Queen's Printer	1959	Ottawa	204	Summary: Survival handbook.	book	SPRI Shelf 910.2(211)	U
556	Cooper, L.Y.	A mathematical model for estimating available safe egress time in fires	es	Fire and Materials, Vol. 6, Nos. 3 & 4	1982	unavail.	unavail.	.	journal	USCG	U
554	Cooper, L.Y.	A concept for estimating available safe egress time in fires	es	Fire Safety Journal, Vol. 5	1983	unavail.	unavail.	.	journal	USCG	U
592	Emmons, H.W.	Experiments with a Fire Math Model	es	in: Fire Safety Science - Proceedings of the Second International Symposium	1978	unavail.	unavail.	.	proceedings	USCG	U
589	Fahy, R.F.	EXIT89 - An evacuation model for high-rise buildings - recent enhancements and example applications	es	International Conference on Fire Research and Engineering	1995	unavail.	unavail.	.	proceedings	USCG	U
619	Galea, E.R.	Predicting the evacuation performance of mass transport vehicles using computer models.	es	in: Fire Safety on Ships: Developments into the 21st Century.	1994	unavail.	unavail.	.	journal	USCG	U
93	Glaser, E.M.	Immersion and survival in cold water.	es	Nature	1950, 166(4234)	unavail.	:1068	Summary: Experiments to determine heat production during swimming.	book	SPRI Shelf (*7)[pub.1990]	U
655	Gwynne, S. and Galea, E.R.	A review of the methodologies and critical appraisal of computer models used in the simulation of evacuation from the built environment.	es	unavail.	1997	unavail.	unavail.	.	book	USCG	U
193	Hewitt, Ian.	Analyzing smoke and toxic gas hazards: preventing ingress into TSR's.	es	British Gas Exploration & Production	1992	UK	31	Summary: This paper describes the physiological effect of smoke and gas from fires on offshore platforms. The probabilities of smoke and toxic gas under credible scenarios are assessed and recommendations are made to mitigate against their ingress into the TSR.	report	Bercha	U
562	Hobday, Rhoden, Bright, Earthy, and Jones	Aiding the control of emergencies on ships	es	in: Fire Safety on Ships: Developments into the 21st Century	1994	unavail.	unavail.	.	book	USCG	U
104	Hutchinson, R.C.	Food for survival after a disaster.	es	Melbourne University Press	1959	Melbourne	69	Summary: On land and sea.	book	SPRI Shelf 910.2(211)	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
107	Inter-Governmental Maritime Consultative Organization.	A pocket guide to cold water survival.	ss	Inter-Governmental Maritime Consultative Organization.	1981	London	20	Summary: A pocket guide to cold water survival.	book	SPRI Pam 656.608	U
112	Keatinge, William, R.	The effect of work and clothing on the maintenance of the body temperature in water.	es	Quarterly Journal of Experimental Physiology.	1961, 46	Cambridge	69-82	Summary: Results of experiments in Department of Experimental Medicine, Cambridge University. Physical exertion found to accelerate fall of men's rectal temperatures in cold water.	book	SPRI Pam 656.608	U
566	MacGregor Smith, J.	An analytical queuing network computer program for the optimal egress problem	es	Fire Technology	1982	unavail.	unavail.	.	journal	USCG	U
583	Malhotra, H.L.	Escape from Fire	es	in: Fires in Buildings - R. Marareau & M. Thomas (eds.)	1986	unavail.	unavail.	.	book	USCG	U
514	Moxie Media Inc.	Emergency platform, rig and vessel abandonment.	es	Moxie Media Inc.	unavail.	New Orleans, LA	unavail.	Summary: This program covers controlled and uncontrolled abandonments and the various means of escape available, including lifeboats, liferafts and water entry. The importance of the station bill, holding realistic drills and other methods of crisis prevention are also discussed in detail. (26 min)	video	Moxie Media Inc MS-EmerPlatAband 1	For Sale
515	Moxie Media Inc.	Emergency helicopter abandonment.	es	Moxie Media Inc.	unavail.	New Orleans, LA	unavail.	Summary: Also available in Portuguese and Spanish. This video outlines the actions required by passengers during controlled, semi-controlled and uncontrolled water ditchings. Emphasis is placed on preflight preparation, knowledge of proper crash position and underwater orientation for location of exits. (24 min)	video	Moxie Media Inc MS-EmerHelAband2	For Sale
519	Moxie Media Inc.	Water entry and survival techniques.	es	Moxie Media Inc.	unavail.	New Orleans, LA	unavail.	Summary: Also available in Spanish. Teaches survival techniques needed to beat the odds if offshore personnel are forced to enter the water as a last means of escape. Includes step-off procedures, use of PFD's, the HELP position, group huddle and survival suits. (27 min)	video	Moxie Media Inc MS-WaterEntry5	For Sale
29	Nicholl, G.W.R.	Survival at sea. The development, operation and design of inflatable marine lifesaving equipment.	es	Allard Coles	1960	London	166	Summary: Drowning and life-saving apparatus at sea. Shipping accidents at sea. Cold regions, life and travel.	book	SPRI Shelf 910.2(211)	U
764	Offshore Technology	EM&I Safety - Escape systems for the offshore industry.	es	Offshore Technology	unavail.	UK	3	Summary: EM&I Safety provides a complete safety advisory service for planning if safety integrity management systems through to the design and commissioning of these systems both offshore and onshore. Principle products include the DONUT personal safety device and the TOES TEMPOS Orientation and Evacuation System.	world wide web	EM&I	U
767	Offshore Technology	Safeguard Technology, Inc - Anti-slip safety products.	es	Offshore Technology	unavail.	Ohio, US	3	Summary: Safeguard Technology is the leading supplier of Anti-slip Safety cover for offshore oil and gas industry.	world wide web	Safeguard Technology	U
769	Offshore Technology	The Shark Group - survival suits, re-breather systems and other survival products	es	Offshore Technology	unavail.	UK	3	Summary: Shark Group is an award winning manufacturer of survival products, including survival suits and re-breather systems for the offshora oil and gas industry, aviation and defense applications world wide.	world wide web	Shark Group	U
578	Pauls, J.L.	Development of knowledge about means of egress	es	Fire Technology	1984	unavail.	unavail.	.	journal	USCG	U
572	Pauls, J.L.	Building evacuation: Research findings and recommendations	es	in: An Introduction, in Fires and Human Behaviour - Cantar (ed.)	1980	unavail.	unavail.	.	book	USCG	U
661	Pauls, J.L. .	Effective-Width Model for evacuation flow in buildings	es	Proceedings of the Engineering	1980	unavail.	unavail.	.	proceeding	USCG	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
				Applications Workshop.					s		
573	Pauls, J.L., and B.K. Jones	Building evacuation: Research methods and case studies	es	in: An Introduction, in Fires and Human Behaviour - Canter (ed.)	1980	unavail.	unavail.	.	book	USCG	U
689	Pollard, Garner, Blethrow, and Lowrey	Passenger Flow Rates between Compartments: Straight-Semented Stairways, Spiral Stairways, and Passageways with Restricted Vision and Changes of Attitude	es	unavail.	1978	unavail.	unavail.	.	.	USCG	U
557	Shields, Silcock & Dunlop	A methodology for the determination of code equivalency with respect to the provision of means of escape	es	Fire Safety Journal	1992	unavail.	unavail.	.	journal	USCG	U
208	Simoes Re, Antonio J.	Evaluation of motions in waves of a thermal instrumented manikin and human subjects.	es	IMD(NRC)	1996	Canada	unavail.	Study: To study the motions of both humans and a thermal instrumented manikin (TIM) caused by waves of different amplitudes and periods, by digitizing images from video records. This information was used in the interpretation of the differences of heat loss in waves between humans and TIM. Also, using the same video imaging process determined the average of the total body surface area exposed to air over a wave cycle of both the humans and the TIM.	study	IMD(NRC)	U
209	Simoes Re, Antonio J.	Thermal instrumented manikin and human subjects.	es	IMD(NRC)	1995	Canada	unavail.	Summary: Implementation of the National Research Council ethical committee guidelines for the use of Human Subjects at the Institute for Marine Dynamics testing facilities. Together with scientists from Canadian Forces Air Command. DCIEM and the Cord Group Ltd. continued to investigate the effects of waves on the insulation properties of dry suits with the use of both six male humans and a thermal instrumented manikin.	study	IMD(NRC)	U
30	Talevosyan, Ara.	The mine's revenge	es	unavail.	unavail.	unavail.	unavail.	Summary: Drowning and life saving apparatus at sea. Shipping accidents at sea.	book	SPRI Pam 656.608	U
342	.	PROD. Preferred Orientation and Displacement Evacuation System.	ev	.	1987 Feb.	.	unavail.	.	periodical	C-NOPB TD157.5C25 No.11 1987	U
343	.	SSB project 2.2 evacuation by sea: Subreport 2: new concepts of evacuation.	ev	.	1980	.	unavail.	.	report	C-NOPB VK1463R5 1980	U
344	.	Survey of offshore drilling unit evacuation systems.	ev	.	1985	.	unavail.	.	survey	C-NOPB VK1463M81985	U
345	.	MODU evacuation systems research and development (program alternatives)	ev	.	1985	.	unavail.	.	book	C-NOPB VK1463Y8 1985	U
346	.	Multiple mode evacuation systems (proposal?)	ev	.	1983	.	unavail.	.	proposal	C-NOPB VK1463N41983	U
347	.	Personnel offshore transport (POT): Dry evacuation systems, part II, phase III report (public summary report)	ev	.	1985	.	unavail.	.	report	C-NOPB VK1463J6 1985	U
348	.	Risk assessment of emergency evacuation from offshore installations: a study carried out for the UK Department of Energy.	ev	.	1983	.	unavail.	.	study	C-NOPB VK1463T4 1983	U
350	.	Models and methodology for	ev	.	1982	.	unavail.	.	book	C-NOPB VK1463 N5 1982	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
		analysis of evacuation operations from offshore structures.									
351	.	Lifescape: an offshore safe haven, emergency control centre, evacuation.	ev	.	1984	.	unavail.	.	book	C-NOPB VK1473L5 1984	U
352	.	Evacuation systems and equipment for mobile offshore drilling rigs: a study for the safety task force of east coast petroleum associations by Det Norske Veritas (Canada) Ltd.	ev	.	1983	.	unavail.	Note: to be used in house only - not for loan.	study	C-NOPB VK1463D4 1983	L
354	.	Project: evacuation of personnel by sea SSB 2.2 - summary report of the Steering Committee for Emergency Preparedness SSB Programme.	ev	.	1983	.	unavail.	.	report	C-NOPB VK1463D42 1983	U
355	.	Evacuation of personnel by sea - end seminar project SSB 2.2: seminar program (complete proceedings)	ev	.	1982	.	unavail.	.	report	C-NOPB VK1463S3 1982	U
356	.	Gemevac: personnel evacuation system.	ev	.	1985	.	unavail.	.	book	C-NOPB VK1463G4 1985	U
359	.	Hyperbaric evacuation study: a discussion document published by AODC based on work carried out by its safety and technical committee.	ev	.	1986	.	unavail.	.	study	C-NOPB VM 981 D4A8 1986	U
360	.	Seascape Systems Limited introduces CASE - Computer-Aided System of Evacuation (Canada Patent # 1208082, United States patent allowed, other patents pending)	ev	.	1988	.	unavail.	.	book	C-NOPB VK1473S4 1988	U
361	.	Evacuation to standby vessels by drilling unit crane.	ev	.	1984	.	unavail.	.	book	C-NOPB TN873A1C32No.106 1984	U
362	.	Escape II - risk assessment of emergency evacuation of offshore installations.	ev	.	1988	.	unavail.	.	book	C-NOPB TN874U5505No.88-285 1988	U
363	.	Enhancements to offshore rig evacuation [video recording]	ev	.	1989	.	unpaged	.	video	C-NOPB VK1463H8 1989	U
364	.	Evacuation chute system.	ev	.	1989	.	unavail.	.	book	C-NOPB VK1463E88 1989	U
365	.	Evacuation: backing up the lifeboats.	ev	.	1989	.	unavail.	.	book	C-NOPB VK1463E85 1989	U
366	.	Report of the investigation into the circumstances attending the evacuation of the floating barge drilling unit "Kulluk" following a gas blow-out in Mackenzie Bay, Beaufort Sea, Canadian Arctic, June 5, 1989	ev	.	1989	.	unavail.	.	report	C-NOPB TN871B5K8 1989	U
367	.	New dimension in offshore emergency evacuation (paper)	ev	.	1990	.	unavail.	.	research	C-NOPB TN863 06 1990 V.4P.517	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
									paper		
368	.	Evacuation technologies applicable to offshore exploration and development operations: phase I report.	ev	.	1990	.	unavail.	.	report	C-NOPB VK1463C6 1990	U
370	.	Evacuation systems - Gemevac, Free Fall, PROD.	ev	.	unavail.	.	unavail.	.	book	C-NOPB VK1463E8	U
373	.	Evacuation in smoke.	ev	.	1994	.	unavail.	.	book	C-NOPB TH9182S6 1994	U
375	.	Hyperbaric medical evacuation risk analysis - pilot study to identify and assess medical emergencies occurring to saturation divers with particular reference to the requirement for hyperbaric evacuation.	ev	.	1993	.	unavail.	.	study	C-NOPB TN874U5605No.93-022 1993	U
377	.	Escape 3 (1993) - review of evacuation systems by DNV Technica for HSE. Third in a series of computer studies done for the HSE.	ev	.	unavail.	.	unavail.	.	study	C-NOPB P.O.#6050	U
379	.	Comparative physical model study of offshore evacuation systems.	ev	.	1996	.	unavail.	.	study	C-NOPB VK1463S5 1996	U
380	.	Comparative physical model study of offshore evacuation systems.	ev	.	1997	.	unavail.	.	study	C-NOPB VK1463 O34 1997	U
381	.	OTH 94 462 - Medication for the treatment of motion sickness during evacuation.	ev	.	1996	.	unavail.	.	book	C-NOPB TN874U55O5 No.94-462 1996	U
383	.	Marine evacuation chute: harbour trial; heavy weather sea trial.	ev	.	1995	.	unavail.	.	book	C-NOPB VK1463D33 1995	U
384	.	Platform evacuation systems - lifeboats - Selantic Skyscape - Gemevac	ev	.	1998	.	unavail.	.	book	C-NOPB VK1463H5 1998	U
386	.	Design, construction, commissioning and testing of the Seascape System LTD. Emergency Evacuation System.	ev	.	1997	.	unavail.	.	book	C-NOPB TN874 U56O5 No.97-009 1997	U
387	.	PROD. Preferred Orientation and Displacement Evacuation System - appendix- February, 1987.	ev	.	1987	.	unavail.	.	book	C-NOPB TD157.5C25No.12 1987	U
388	.	Seascape Systems Limited introduces CASE - Computer-Aided System of Evacuation (Canada Patent # 1208082, United States patent allowed, other patents pending)	ev	.	1985	.	unavail.	.	book	C-NOPB VK1473S4 1985	U
390	.	Model testing of offshore evacuation systems.	ev	.	1992	.	unavail.	.	book	C-NOPB VK1463M84 1992	U
397	.	Manned Independent Personnel Rescue Vehicle (MIPRV)	ev	.	1975	.	unavail.	.	book	C-NOPB VK1474A25 1975	U
410	.	Safe evacuation of men during emergency abandonment of offshore oil and gas installations:	ev	.	1983	.	unavail.	.	book	C-NOPB VK1463C7 1983	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
		survival while awaiting rescue.									
451	.	Escape II - risk assessment of emergency evacuation of offshore installations.	ev	.	1988	.	unavail.	Summary: Computer program for modeling of evacuation using conventional davit-launched lifeboats.	book	C-NOPB TN874U55O5 No.88-285 1988	U
711	.	New departure for offshore evacuation systems.	ev	Disaster Management	1989	unavail.	unavail.	Subject: Skyscape.	periodical	DNV	U
306	.	A technical study of shelter versus evacuation when faced with a release of hydrogen sulfide.	ev	Energy Resources Conservation Board	1992	Calgary, Alberta	unavail.	.	study	NEB TP754/T4	U
724	.	Chevron aims to deploy TOES in early 1993.	ev	Financial Times Business Reports - Energy.	1992 Oct.	unavail.	unavail.	Subject: TOES.	periodical	DNV	U
624	.	Research into evacuation of aircraft passengers.	ev	Fire International	1989	unavail.	unavail.	.	journal	USCG	U
757	.	The development of an easily recovered liferaft. Report No. I4446.C, March 1997 (draft). Prepared for the Transportation Development Centre (TDC). TP 1304IE	ev	Fleet Technology Limited (FTL)	1987	Canada	unavail.	Summary: An investigation was undertaken into methods to improve the recovery of occupied SOLAS (Safety Of Life At Sea) liferafts by Search and Rescue SAR vessels. The work involved a review of previous R&D research on liferaft recovery methods and associated problems, and the establishment of performance and design constraints for direct recovery of an occupied raft. The report concludes that the modified raft and recovery system will successfully recover a fully loaded 16 person liferaft in high sea states in less than two minutes, and that the promise shown warrants further evaluation, development of a liferaft retrieval mechanism, and exposure of the ideas to the SAR community.	report	FTL	U
759	.	Investigation of capsize phenomena in inflatable liferafts. Prepared for Institute of Marine Dynamics. Report No.4486.F.R.	ev	Fleet Technology Limited (FTL)	1997	Canada	23	Summary: The Institute of Marine Dynamics (IMD) of the National Research Council of Canada contracted Fleet Technology Limited (FTL) to carry out an experimental investigation of the seakeeping characteristics of liferafts. An on-site subcontractor, Marineering Limited was engaged to conduct the test program in the 200 metre towing tank at IMD during May 1996. Over 135 separated tests were conducted in April-May 1996. This report summarizes the findings of those tests.	report	FTL	U
718	.	PROD System accepted by Department of Transport.	ev	Focus 64	19?	unavail.	unavail.	Subject: PROD	periodical	DNV	U
255	.	Escape II - risk assessment of emergency evacuation of offshore structures.	ev	Her Majesty's Stationary Office	1988	London	80	Computer program for modeling of evacuation using conventional davit-launched lifeboats.	report	NEB TC1565/E83	U
715	.	Controversy surrounds "hazards" of free-fall lifeboats.	ev	Lloyd's Casualty Week	1995 Apr.	unavail.	unavail.	Subject: FFL.	periodical	DNV	U
303	.	The evaluation of surface evacuation procedures for a ditched helicopter : Phase II.	ev	NEB	1996 / 1998 (Mfiche)	Calgary, Alberta	36	Summary: Following the recommendations outlined in Phase I experiment 9see PERD Report 200-9, July 1995), which was conducted under calm conditions, in Phase II, 24 male and 19 female subjects conducted a series of evacuations from Norwegian Underwater Technology Centre's (Nutec) Super Puma Helicopter Simulator during more severe sea state conditions. Dry evacuations were compared to wet evacuations using two different types of aviation liferafts (canopy & non-canopy) on both the windward and leeward sides. The results indicate that the preferred method of evacuation is the dry method , on the winward side using a non-canopy liferaft.	report / Mficha	*report*: NEB TA 7/F43/no.17, *Microfiche*: NEB TA 7/F43/no.17 Mfiche	U
305	.	The evaluation of surface evacuation procedures for a ditched	ev	NEB	1996	Calgary, Alberta	47	Summary: Currently, both in Canada and internationally there is considerable disagreement concerning the best methods to be used	report	NEB TA 7/F43/no.9	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
		helicopter : Phase II.						when evacuating a downed helicopter into liferafts. The two major methods of instruction taught to helicopter crews and passengers are known as the "dry shed" method and the "swim away" method. No practical scientific applied scientific data has been previously collected to differentiate between the two methods. This study was conducted in attempt to determine the best procedure to be utilized by passengers and crew when evacuating from a ditched offshore helicopter into its liferafts under different conditions.			
716	.	New system get lifeboats safely away from platforms.	ev	Ocean Industry	1991 Apr/May	unavail.	unavail.	Subject: TOES.	perio dical	DNV	U
704	.	Lifeboat launcher passes test.	ev	Offshore Engineer	1989 Oct.	unavail.	unavail.	Subject: CASE.	perio dical	DNV	U
707	.	Toes pulls away.	ev	Offshore Engineer	1989 Feb.	unavail.	unavail.	Subject: TOES.	perio dical	DNV	U
712	.	Freefall spotlight shifts to floaters.	ev	Offshore Engineer	1987 Sept.	unavail.	unavail.	Subject: FFL.	perio dical	DNV	U
721	.	Safety.	ev	Offshore Engineer	19? Nov.	unavail.	unavail.	Subject: TOES.	perio dical	DNV	U
722	.	Evacuation: backing up the lifeboats.	ev	Offshore Engineer	1989 Oct.	unavail.	unavail.	Subject: Skyscape, Telescape, Donut, Stairs, Bridges.	perio dical	DNV	U
734	.	TOES in the water.	ev	Offshore Engineer	1994 May	unavail.	unavail.		perio dical	DNV	U
735	.	Speedy sock provides safe decent.	ev	Offshore Engineer	1994 May	unavail.	unavail.	Subject: SOCK.	perio dical	DNV	U
736	.	Strong-arm launcher goes on trial.	ev	Offshore Engineer	1994 May	unavail.	unavail.	Subject: Seascape.	perio dical	DNV	U
737	.	Prod's progress eases maintenance.	ev	Offshore Engineer	1994 May	unavail.	unavail.	Subject: PROD.	perio dical	DNV	U
714	.	Lightweight evacuation for not normally manned platforms.	ev	Offshore Engineer Norway Review	1993 Sept.	unavail.	unavail.	Subject: Skyscape.	perio dical	DNV	U
726	.	Offshore lifeboat launch.	ev	Offshore Research Focus	19?	unavail.	unavail.	Subject: Seascape.	perio dical	DNV	U
727	.	Stairways and chutes evaluated.	ev	Offshore Research Focus	19?	unavail.	unavail.	Subject: SJL Stairs, Telescape.	perio dical	DNV	U
754	.	To undertake the development of an easily recovered liferaft. Report I 4446P	ev	proposal submitted to Public Works and Government Services Canada (PWSCG) by Fleet Technology Limited.	1994 Dec.	Canada	unavail.	.	report	FTL	U
720	.	Weight versus buoys.	ev	Safety at Sea International	19?	unavail.	unavail.	Subject: SCAT, TOES.	perio dical	DNV	U
728	.	Launch and recovery system.	ev	Safety at Sea International	19?	unavail.	unavail.	.	perio dical	DNV	U
729	.	TOES.	ev	Safety at Sea International	19?	unavail.	unavail.	Subject: TOES.	perio dical	DNV	U
730	.	Davits in the dock.	ev	Safety at Sea International	19?	unavail.	unavail.	Subject: DLL.	perio dical	DNV	U
731	.	Innovation in rescue boat davits.	ev	Safety at Sea International	19?	unavail.	unavail.	.	perio dical	DNV	U
732	.	Liferaft materials.	ev	Safety at Sea International	19?	unavail.	unavail.	.	perio dical	DNV	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
733	.	The 17th International Lifeboat Conference.	ev	Safety at Sea International	19?	unavail.	unavail.	.	conference proceedings	DNV	U
738	.	Freefall from danger.	ev	Safety at Sea International	1996 July	unavail.	unavail.	Subject: FFL.	periodical	DNV	U
739	.	Buoys on trial.	ev	Safety at Sea International	19?	unavail.	unavail.	Subject: TOES.	periodical	DNV	U
740	.	Launch and recovery systems update.	ev	Safety at Sea International	1996 July	unavail.	unavail.	.	periodical	DNV	U
713	.	Socking it to safety.	ev	Statoil Magazine	1986 4	unavail.	unavail.	Subject: Skyscape.	periodical	DNV	U
717	.	All weather lifeboat launcher put to test.	ev	unavail.	19?	unavail.	unavail.	Subject: PROD.	periodical	DNV	U
723	.	Seascape Launch.	ev	unavail.	19?	unavail.	unavail.	Subject: Seascape.	periodical	DNV	U
725	.	TOES solution to offshore evacuation.	ev	unavail.	19?	unavail.	unavail.	Subject: TOES.	periodical	DNV	U
19	ARK Associates	Terra Nova PrOD Winterization (Terra Nova order No 062-DB93-PBLC13A Ref: PrOD Study Document No TN- BR-LC15-V00-001 Item 2.1 Part B	ev	Ark Associates	1999, June 17 & 18	UK	18	Summary: Introduction and objectives. As part of Terra Nova Alliance PrOD study (document No BR LC15-V00-001) part B, placed on Schat Harding under Order NO 062-DB93-PBLC13A, The winterization issues, associated with the use and operational of the PrOD system, (...).	study	Bercha	U
563	Bottomley, Muir & Lower	Aircraft evacuations: The effect of a cabin water spray system upon evacuation rates and behaviour	ev	unavail.	1993	unavail.	unavail.	.	.	USCG	U
561	Cagliostro, D.E.	A user operated computer model to study strategy in evacuation of passenger aircraft	ev	Eighth International Conference on Fire Safety	1983	unavail.	unavail.	.	book	USCG	U
81	Canadian Coast Guard. Arctic Ship Safety.	Cold water marine survival guide	ev	Canadian Coast Guard	n.d.	Ottawa	96	Summary: Covers evacuation scenarios; evacuation equipment and procedures; conventional and additional survival equipment; survival; health concerns; vegetation and wildlife; and Canadian search and rescue system.	book	SPRI Shelf 656.61.052	U
613	Chalmet, Francis and Saunders.	Network models for building evacuation.	ev	Fire Technology	1982	unavail.	unavail.	.	journal	USCG	U
537	Coleshaw, S.	RGIT Limited helicopter escape research.	ev	RGIT Limited	unavail.	UK	5	Summary: This paper discusses research that is being carried out on behalf of the Civil aviation authority and the Health and Safety Executive by Dr. Susan Coleshaw, head of RGIT's Centre for Health and Safety Sciences. The research will fully utilise RGIT's helicopter simulator, used to train offshore personnel and will investigate escape from a side-floating helicopter.	internet	RGIT Limited	U
460	Coleslaw, Sue R K.	Liferaft inflation study.	ev	Offshore Research Focus	issue 126	UK	unavail.	Summary: A study for HSE by RGIT Ltd. that investigates liferafts to inflate on demand and review of liferafts history, legislation and use.	magazine	Offshore Research Focus	U
699	Constantinis, D.	Personal escape to the sea - TOES - a device to improve lifeboat performance.	ev	EM&I, IIR Conference	1992	Aberdeen	unavail.	.	paper	DNV	U
771	DBC Marine Safety Systems Ltd	DBC Marine Safety Systems Approved evacuation slide systems.	ev	DBC Marine Safety Systems Ltd	unavail.	Canada	2	Summary: Specifically designed for Low Freeboard Vessels, this combination Slide and Platform is stowed in an innovative space saving container and provides safe, speedy evacuation for all	world wide web	DBC	U

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								passengers - young, old and physically challenged.			
190	Det Norske Veritas Industry AS	DNV Harding Safety A/S Technical Report. Selection of evacuation means for offshore installations. Report NR. 45212048	ev	Det Norske Veritas Industry AS	1995	Norway	34	Summary: This report draws together the results of many risk- and escape, evacuation and rescue studies of offshore installations. The importance of the evacuation system is emphasized. Key success factors for safe evacuation is described. The report contains guidelines on how to select optimal evacuation means for a given installation under the constraints of regulations, minimum requirements to efficiency of evacuation and cost-benefit. A quick method for cost-benefit evaluation of evacuation means is given. The method can also be used to compare investments in the evacuation systems against alternative safety measures.	report	Bercha	U
701	DNV	Compilation of risks from evacuation systems.	ev	HSE Offshore Safety Division	1993	UK	unavail.	.	paper	DNV	U
17	DNV Consultancy Services Johan Potgieter	Literature Review of Offshore Platform Sea Evacuation Systems prepared for Sable Offshore Energy Project 2663	ev	DNV Consultancy Services	1997, June	Canada	19	Summary: Scope of Work: This review considers general escape and evacuation methods for potential application to the SOEP Thebaud PUQ & Wellhead Platforms, Venture Wellhead Platform and North Triumph Satellite Platform. The study is concerned with primary evacuation methods i.e. lifeboat based systems, mass evacuation systems and personnel escape systems. Review of precautionary evacuation systems (helicopters) whilst referenced is outside the scope of this review as is rescue and retrieval of personnel.	report	Bercha	U
611	Drager, K.H. and Orset, S.	MEPdesign: An European project aiming at improving evacuation performance from passenger ships during accident situations.	ev	.	.	unavail.	unavail.	.	.	USCG	U
586	Dwyer, C.F.	Evacuation of Aerial Passenger Tramways and Ski Lifts	ev	unavail.	unavail.	unavail.	unavail.	.	.	USCG	U
685	Ford, M	Evacuation of offshore installations - The problems highlighted in the Cullen Report.	ev	IIR Conference	1992	Aberdeen	unavail.	.	paper	DNV	U
567	Galea, Filippidis, Lawrence & Owen	An evacuation demonstration of a typical high speed craft using the EXODUS evacuation model	ev	unavail.	1998	unavail.	unavail.	.	.	USCG	U
744	Gebreab, B., Gin, J., Steward, M.,	Development of the SOLAS Liferaft. Report TP 11672E.	ev	International Marine Safety Solutions.	1993 March	unavail.	unavail.	.	report	FTL	U
755	Hervey, C.L., Jordan, D.J.	Investigation of the use of drogues to improve safety of sailing yachts, final report No. CG-D-20-87.	ev	U.S. Department of Transportation, United States coast Guard, Office of Engineering and Development	unavail.	Washington, D.C.	unavail.	.	report	FTL	U
703	HSE	Analysis of UK PROD trials.	ev	Heriot Watt University for UK DOE	1987	unavail.	unavail.	.	paper	DNV	U
657	King, B.G.	Aircraft emergency evacuation: A method for evaluating devices and exit provisions.	ev	unavail.	unavail.	unavail.	unavail.	.	book	USCG	U
584	Kisko, T.M., and R.L. Francis	EVACNET+: A computer program to determine optimal building evacuation plans	ev	Fire Safety Journal, vol. 9	1985	unavail.	unavail.	.	journal	USCG	U
553	Kostreva, Michael, and	A comparison of two methodologies in HAZARD I fire egress analysis	ev	Fire Technology	1998	unavail.	unavail.	.	journal	USCG	U

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	Laura Lancaster										
749	Latimer-Needham, C.H.	The design of inflatable liferafts.	ev	The Institution of Naval Architects.	1958 Dec.	unavail.	unavail.	.	report	FTL	U
299	Leafloor, F.C.	Enhancements to offshore rig evacuation [video recording]	ev	G.M. Media Productions Limited	1989	St. John's, Nfld.	unavail.	Subjects: Offshore structures - Safety measures Drilling platforms - Safety measures Life saving apparatus - Canada, east Coast Marine (Region). Notes: VHS. Time: 16 minutes.	video	NEB TC1665/E55/ Video	U
301	Leafloor, F.C.; Yves, G.B.	PROD. Preferred Orientation and Displacement Evacuation System.	ev	Canada Oil and Gas Lands Administration	1987	Ottawa	unavail.	Subjects: Drilling platforms - Evacuation Oil well drilling, Submarine - Canada - Safety measures.	book	NEB TD169/C3/no.11-12	U
590	Levin, Bernard	EXITT - A simulation model of occupant decisions and actions in residential fires	ev	in: Fire Safety Science - Proceedings of the Second International Symposium	1978	unavail.	unavail.	.	proceedings	USCG	U
534	LHR Services and Equipment, Inc.	Safety from offshore safety supplier LHR.	ev	LHR	unavail.	Houston, TX	unavail.	Summary: Safety is more than just a word at LHR Services and Equipment, Inc. We are dedicated to safety in the offshore oil industry. We are pleased to introduce the premier edition of our online "S.O.S." (Standardize On Safety) catalog. This catalog contains the most select assembly of industry approved offshore oilfield safety equipment available.	catalog	LHR	U
614	Lovas, G.G.	On performance measures for evacuation systems.	ev	European Journal of Operational Research.	1995	unavail.	unavail.	.	journal	USCG	U
15	Magellan Jacques Whitford	Criteria for the assessment and selection of Enhanced Evacuation Systems A frame work for continuous improvement for Natural Resources Canada.	ev	Magellan Jacques Whitford	1999. March	Canada	40	Summary: The aim of this research is to propose a methodology that will allow operators, regulators, and contractors to assess and select arrangements for escape, evacuation and rescue for offshore installations operating in Canada. The results of this research were obtained through literature review, consultation and a specialist team review of existing assessment methods.	report	Bercha	U
654	Marcus, J.E.	A review of computer evacuation models and their data needs.	ev	unavail.	1994	unavail.	unavail.	.	book	USCG	U
658	Melinek, S.J. and Booth, S.	An analysis of evacuation times and the movement of crowds in buildings.	ev	unavail.	1975	unavail.	unavail.	.	book	USCG	U
24	Melville Shipping Ltd.	Ship evacuation and survival equipment testing on the RV Nathaniel B. Palmer	ev	Transportation Development Centre	1992	Canada	variously paged	Summary: Describes ship evacuation trial and survival equipment testing conducted onboard US Research Vessel Nathaniel B. Palmer during August/September 1992 voyage to Weddell Sea. Reports primary objective was to investigate problems of ship evacuation in variety of ice conditions.	report	SPRI 629.12[Nathaniel B. Palmer]	U
772	Mills, F., Coleshaw, S.R.K.	Evacuation and casualties using Freefall TEMPSC.	ev	Centre for Health and Safety Sciences, RGIT Limited	unavail.	Aberdeen	9	Summary: This paper deals with issues such as stretcher handling, generic methods of triage and the transportation and security of casualties within freefall lifeboats. Recommendations have been made to help develop harmonised procedures for the offshore industry.	world wide web	RGIT	U
516	Moxie Media Inc	Lifeboat operation and survival practices.	ev	Moxie Media Inc.	unavail.	New Orleans, LA	unavail.	Summary: Also available in Spanish. Only with the instruction on proper methods of loading, releasing, handling and maintaining life support systems can these complex survival craft prove effective at saving lives. (26 min)	video	Moxie Media Inc MS-LifeboatOp3.	For Sale
517	Moxie Media Inc	Liferaft operation and survival practices.	ev	Moxie Media Inc.	unavail.	New Orleans, LA	unavail.	Summary: Also available in Portuguese and Spanish. Davit, throw-over and aviator liferafts are used to show effective means of using these life-saving crafts. Pyrotechnics, provisions and handling in rough seas are also demonstrated. (30 min)	video	Moxie Media Inc MS-LiferaftOp4	For Sale
520	Moxie Media	Fire prevention and response for	ev	Moxie Media Inc.	unavail.	New Orleans,	unavail.	Summary: This program, shot onboard working ships, offshore service	video	Moxie Media Inc	For

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
	Inc.	the maritime industries.				LA		vessels and tow boats, educates crewmembers about the elements of fire, fire extinguisher types and their proper usage, prevention through housekeeping and containment, first responder actions, alarms and the importance of drills.			Sale
521	Moxie Media Inc.	Initial response.	ev	Moxie Media Inc.	unavail.	New Orleans, LA	unavail.	Summary; An overview of the different types of oil and the hazards involved at various stages of the spill, including fire risk, toxicity, environmental concerns, incident management and responder safety. (27 min)	video	Moxie Media Inc EFG-InitOilSp1	For Sale
524	Moxie Media Inc.	Confined space entry.	ev	Moxie Media Inc.	unavail.	New Orleans, LA	unavail.	Summary: To avoid serious hazards associated with a confined space entry employees must be quick-thinking and fast-acting. In fact, according to recent studies, more than half of all confined space fatalities are would-be rescuers. A safe, easy to follow confined space program is life-and-death critical to the safety of your employees. (17 min)	video	Moxie media Inc CLM-ConfSpEntry	For Sale
508	Moxie Media Inc.	Safe swing rope and personnel basket transfers for offshore oil personnel	ev	Moxie Media Inc.	unavail.	New Orleans, LA	unavail.	Summary: Available in English and Spanish. This program explains the proper use of the swing rope and personnel basket for personnel transfers from vessels to offshore platforms and rigs. Special attention is given to transfers in rough seas, the transfer of equipment and emergency response procedures. A brief introduction to safe dock and gangway transfers is also included. (20 min)	video	Moxie Media Inc OFF-SafeSwingRope)	For Sale
564	Muir, Marrison & Evans	Aircraft evacuations: The effect of passenger motivation and cabin configuration adjacent to the exit	ev	unavail.	1989	unavail.	unavail.	.	.	USCG	U
131	Nicholl, G.W. R.	Survival at sea. The development, operation and design of inflatable marine lifesaving equipment.	ev	Allard Coles	1960	London	166	Summary: Survival at sea. The development, operation and design of inflatable marine lifesaving equipment.	book	SPRI Shelf 910.2(211)	U
539	Nova	Pioneers of survival	ev	Nova Online	unavail.	World Wide Web	6	Summary: Martin Verhoef runs a lifeboat company called the Verhoef Aluminum Scheepsbouw, located in the Netherlands. It specializes in the totally enclosed, free-fall lifeboat, which is designed to get passengers quickly and safely from danger, from sinking ships to burning offshore oil rigs. this is an interview with Verhoef by Nova Online discussing the company and the free-fall lifeboat system.	internet	Nova Online	U
763	Offshore Technology	Norsafe A/S - Lifeboats, rescue and freefall boats.	ev	Offshore Technology	unavail.	Norway	3	Summary: Noresafe's range of survival products is amongst the most advanced in the world. Our research and development centre in Arendal is managed by some of the best and most experienced survival system engineers in the world. Products include lifeboats, rescue boats, freefall boats and MOB boats.	world wide web	Norsafe	U
768	Offshore Technology	Survival Systems International - single cable launched and survival capsules.	ev	Offshore Technology	unavail.	UK	3	Summary: The Whitaker type single fall capsule was designed specifically for the offshore oil and gas industry. In 1987 Survival Systems International took over the production and worldwide service of the strongest and safest survival craft available to the industry.	world wide web	Survival Systems	U
640	Owen, Galea and Lawrence	The EXODUS Evacuation Model applied to building evacuation scenarios.	ev	J. Fire Protection Engineering	unavail.	unavail.	unavail.	.	report	USCG	U
587	Perry, Lindell & Greene	Evacuation planning in emergency management	ev	unavail.	1981	unavail.	unavail.	.	.	USCG	U
191	Sales, Gordon J., and McKibben, Byron.	Ensuring air breathability within the TSR including preventing smoke and gas ingress.	ev	Consafe Engineering (UK) Limited	unavail.	UK	47	Summary: This report focuses on the integrity of the TSR Ventilation System, environmental analysis and the influences on TSR, prevention of smoke and gas ingress into TSR, and minimization of the smoke and gas ingress into the TSR: active and passive options.	report	Bercha	U

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700	Simoes Re, A.J.	Comparative physical model study of offshore evacuation systems.	ev	National Research Council Canada - Institute for Marine Dynamics	1996	Canada	unavail.	.	paper	DNV	U
702	Simoes Re, A.J.	Evacuating offshore structures.	ev	SASMEX International 97, National Research Council, Institute for Marine Dynamics, Canada	1997	Canada	unavail.	.	paper	DNV	U
201	Simoes Re, Antonio J.	Offshore evacuation systems study.	ev	IMD(NRC)	1999	Canada	unavail.	Summary: Study to identify a methodology for assessing methods of escape from offshore structures, reviewing model scale tests and computer simulations. Development of physical model test programs that may be used as input and/or validation of theoretical and numerical methods used in the selection of offshore evacuation systems. Collation of information from physical modeling and full scale test experience that may be used as an input into both the computer modelling and risk analysis. Identification of risk analysis models used by operators in the selection of evacuation systems. Work in cooperation with Transport Canada.	study	IMD(NRC)	U
202	Simoes Re, Antonio J.	Rig evacuation system study.	ev	IMD(NRC)	1998	Canada	unavail.	Summary: Study to identify a methodology for assessing methods of escape from offshore structures. Review of model scale experiments and computer simulations. Data collected will provide evaluation standards for evacuation systems from offshore structures.	study	IMD(NRC)	U
203	Simoes Re, Antonio J.	Leeway phase II	ev	IMD(NRC)	1997	Canada	unavail.	Summary: In cooperation with Seaconsult conducted a study into the leeway of a 20 person liferaft with a 100% and 50% complement of personnel for different orientations, floor inflation and drift rates. Data inputted into computer models used by search and rescue officials.	study	IMD(NRC)	U
205	Simoes Re, Antonio J.	"Gyrosphere" life-craft concept.	ev	IMD(NRC)	1997	Canada	unavail.	Summary: Development of a test program to determine the feasibility of a spherical lifecraft concept in waves. In particular, the difference in accelerations between the inner and outer spheres and the quantification of the motions of the inner sphere when subject to different wave heights and frequencies. The effect of tether versus free to drift setup was also evaluated. Data reported and presented the Newfoundland and Labrador Minister of Mines and Energy.	study	IMD(NRC)	U
206	Simoes Re, Antonio J.	Comparative study of offshore evacuation systems.	ev	IMD(NRC)	1996	Canada	unavail.	Summary: Comparison of four offshore evacuation systems for semi-submersible units in which all the parameters were common, except the means of launching the lifeboats. The main objectives of the study were to assess the effectiveness of the different launching systems and to evaluate three important parameters, namely, the smoothness of delivery of the lifeboat to the water, the ability of the system to work when the semi-submersible was damaged, and the ability of the lifeboat to get away from the rig. The semi-submersible motion data as well as the totally enclosed motor propelled craft deployment and get-a-way data were summarized in a report. A paper entitled "Evacuation of Offshore Structures" and based on the experimental model data was prepared for the Safety at Sea Conference, SASMEX'97.	study	IMD(NRC)	U
211	Simoes Re, Antonio J.	Full scale trials of the Seascape Deployment System.	ev	IMD(NRC)	1994	Canada	unavail.	Summary: Instrumentation and measurement of the impact accelerations experienced by a 36 person lifeboat, as it is lowered to the water surface. Comparison of the full-scale trial results with 1:15 and 1:18 model scale test data.	study	IMD(NRC)	U
215	Simoes Re, Antonio J.	The Seascape System: results of tests in short crested irregular waves on a 1:18 scale model.	ev	IMD(NRC)	1992	Canada	unavail.	Summary: The Seascape System lifeboat evacuation system model was installed on a model of the jacket structure "Rough Bravo". Experiments were conducted on short crested irregular waves	study	IMD(NRC)	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
								corresponding to one, ten and one hundred years wave conditions. During the experiments the impact accelerations of the Totally Enclosed Motor Propelled Survival Craft "TEMPSC" and the deployment arm were measured.			
217	Simoes Re, Antonio J.	Results of tests in waves on a 1:15 scale model of the Computer Aided System of Evacuation "CASE".	ev	IMD(NRC)	1989	Canada	unavail.	Summary: Scale model experiments of the "CASE" evacuation system in irregular waves of 13 second period and wave heights of 3.35 and 7.5 metres. The experiments were conducted at various heading angles and with different trim and list conditions. Impact accelerations, cable load, deployment speed and wave loads were measured during experiments.	study	IMD(NRC)	U
218	Simoes Re, Antonio J.	Computer Aided System of Evacuation "CASE" model tests.	ev	IMD(NRC)	1986	Canada	unavail.	Summary: Testing of a new lifeboat evacuation system concept for use on semi-submersibles, developed by Seascape Systems Ltd. of St. John's, Newfoundland. The experiments were conducted to determine the feasibility of the concept. In particular, to demonstrate qualitatively, lifeboat cradle interaction while deploying on severe sea states and to determine impact acceleration with increased deployment speed.	report	IMD(NRC)	U
4	Umoe Schat-Harding	Offshore - Freefall, Conventional Survival Systems	ev	Schat-Harding	1999 (?)	Norway	4	corporate brochure	brochure	Bercha	U
5	Umoe Schat-Harding	Service - Service, Spare Parts, Refurbishment	ev	Schat-Harding	1999 (?)	Norway	4	corporate brochure	brochure	Bercha	U
6	Umoe Schat-Harding	Cruise - Survival Systems, Cruise Tenders	ev	Schat-Harding	1999 (?)	Norway	4	corporate brochure	brochure	Bercha	U
7	Umoe Schat-Harding	Shipping - Free Fall, Conventional Survival Systems	ev	Schat-Harding	1999 (?)	Norway	4	corporate brochure	brochure	Bercha	U
194	Umoe Schat-Harding As.	MCB 28 General Arrangement External/Internal W/Tor.	ev	Schat-Harding	1993	Norway	6	Summary: Technical drawings of the MCB 28 Lifeboat, general arrangement internal and external.	drawings	Bercha 12158B/12120B/12159A	U
195	Umoe Schat-Harding As.	FF1000S (Skid) general arr. tank and chemical version and seating arrangement 62 persons.	ev	Schat-Harding	1999	Norway	4	Summary: Technical drawings of the FF1000 (Skid) lifeboat general arrangement tank and chemical version and drawing of the seating arrangement for 63 persons of the same model of lifeboat.	drawings	Bercha N12654(3)/N12678(5)	U
196	Umoe Schat-Harding As.	Specification sheets for survival craft and launching arrangements designed by Schat-Harding.	ev	Schat-Harding	1999	Norway	17	Summary: The following is a list of brochures with technical specifications pertaining to various survival craft designed by Schat-Harding: LA700A freefall launching arrangement, winch EW 02 PL (LD) (ELD), hydraulic for LA600A/LA700DA, totally enclosed survival craft, VIP gravity davits - fully inside shipside, partly enclosed survival craft, combined cruise tender / partly enclosed survival craft, single arm pivot davits for rescue boats, Mob rescue boats, davits for totally enclosed lifeboats, davit Ord/DM/WO80L-mcb600, free fall skid launching system totally enclosed survival craft and FF1000D freefall survival craft.	brochure	Bercha	U
189	Umoe Schat-Harding As.	Heavy service new service and testing requirements call for careful planning. Issue Two	ev	Schat-Harding	1999	Norway	4	Corporate Brochure	brochure	Bercha	U
568	Walker, W.	An introduction to deployment analysis	ev	in: Fire Department Deployment Analysis - Walker, Chaiken & Ignall (eds.)	1979	unavail.	unavail.	.	book	USCG	U
575	Watts, J.M.	Computer models for evacuation	ev	Fire Safety Journal	1987	unavail.	unavail.	.	journ	USCG	U

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		analysis							al		
565	Weinroth, J.	An adaptable microcomputer model for evacuation management	ev	Fire Technology	1989	unavail.	unavail.	.	journal	USCG	U
378	.	Hyperbaric Environment Operations	h	.	1995	.	unavail.	Summary: Order of December 22, 1995 - relating to the safety training methods of some marine equipment companies operating in a hyperbaric environment - 41 p. decree of May 15, 1992 - defining procedures to be used in a hyperbaric environment, as regards access work duration evacuation and organization of work - 30 p. decree of January 28, 1991 - defining the procedures for safety training of personnel taking part in hyperbaric operations - 25 p. decree of March 28, 1991 - defining recommendations to medical doctors responsible for the medical supervision of workers operating in a hyperbaric environment - 12 p. decree of August 20, 1991 - prescribing the conditions under which a derogation may be granted as regards the age limit for applying for a certificate of competence in hyperbaric operations - 3 p. decree no.90-277 of March 28, 1990 - relating to workers operating in a hyperbaric environment - 18 p.	decree / order	C-NOPB TN874F7 1995	U
353	.	Critical behavior pattern in an evacuation operation Veritas Report No. 82-1144.	h	unavail.	1982	unavail.	unavail.	.	report	C-NOPB TN871S3W7 1982	U
371	.	Human factors in emergency response offshore - developments in evacuation, escape and rescue.	h	unavail.	1993	unavail.	unavail.	.	book	C-NOPB VK1463 H8 1993	U
372	.	Human factors analysis of evacuation, escape and rescue from offshore installations.	h	unavail.	1993	unavail.	unavail.	.	book	C-NOPB TN874U5605No.93-004 1993	U
442	.	Human factors in emergency response offshore - developments in evacuation, escape and rescue.	h	unavail.	1993	unavail.	unavail.	.	book	C-NOPB VK1463H8 1993	U
443	.	A human factors analysis of evacuation, escape and rescue from offshore installations.	h	unavail.	1993	unavail.	unavail.	.	book	C-NOPB TN874U56O5No.93-004 1993	U
453	.	Human factors in emergency response offshore - developments in evacuation, escape and rescue.	h	unavail.	1993	unavail.	unavail.	.	book	C-NOPB VK1463 H8 1993	U
414	.	Thermal evaluation of hyperbaric rescue chambers.	h	unavail.	1980	unavail.	unavail.	.	book	C-NOPB VM981D4K3 1980	U
415	.	Endurance test of lung-powered scrubbers designed for hyperbaric rescue chambers and stranded diving bells.	h	unavail.	1981	unavail.	unavail.	.	book	C-NOPB VM987F78 1981	U
427	.	After-drop and death after rescue from immersion in cold water (from hypothermia ashore and afloat - conference proceedings	h	unavail.	1981	unavail.	unavail.	.	conference proceedings	C-NOPB VK 1447H9G58 1981	U
674	Alvord, D.M.	The escape and rescue model: A simulation model for the emergency evacuation of board and care homes	h	unavail.	unavail.	unavail.	unavail.	.		USCG	U
483	American Bureau of	The human element in safety at sea. In: Surveyor Vol.27/No.3,	h	ABS	1996	New York	unavail.	.	periodical	IMO Library	U

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	Shipping (ABS)	1996.									
620	Baker, G.W.	Preventing disastrous behavior.	h	in: Man and Society in Disaster, Baker and Chapman (eds.).	1962	unavail.	unavail.	.	book	USCG	U
469	Beck, W.G. / Sea Safety Group (UK)	Fire safety : A personal viewpoint : Signal Review	h	Sea Safety Group (UK)	1996	Camborne	unavail.	.	periodical	IMO Library	U
679	Bickman, L., et al	A Model of Human Behaviour in a Fire Emergency	h	unavail.	1977	unavail.	unavail.	.	book	USCG	U
600	Bodamer, M.	How people behave in fires	h	Fire Prevention, 224	1969	unavail.	unavail.	.	journal	USCG	U
682	Breaux, J. et al	Psychological aspects of behaviour of people in fire situations	h	unavail.	1976	unavail.	unavail.	.	book	USCG	U
570	Bryan, J.L.	Behavioral response to fire and smoke	h	in: SFPE Handbook of Fire Protection Engineering	1995	unavail.	unavail.	.	book	USCG	U
633	Bryan, J.L.	Smoke as a determinant of human behavior in fire situations.	h	unavail.	1977	unavail.	unavail.	.	book	USCG	U
680	Bryan, J.L.	An Examination and analysis of the dynamics of human behaviour in the MGM Grand Hotel fire	h	unavail.	1983	unavail.	unavail.	.	book	USCG	U
673	Bryan, J.L. et al	The determination of behaviour response patterns in fire situations, Project People II	h	unavail.	1980	unavail.	unavail.	.	.	USCG	U
659	Bryan, J.L. et al".	An examination and analysis of the dynamics of the human behavior in the fire incident at the Taylor House on April 11, 1979	h	unavail.	1979	unavail.	unavail.	.	book	USCG	U
671	Canter, D.	Studies of Human Behaviour in Fire: Empirical Results and their Implications for Education and Design	h	unavail.	unavail.	unavail.	unavail.	.	.	USCG	U
666	Christian, P.	Impact of the Americans with Disabilities Act on Casco Bay Lines.	h	unavail.	1995	unavail.	unavail.	.	book	USCG	U
591	Clisby, C.	Experiencing Fires	h	in: An Introduction, in Fires and Human Behaviour - Canter (ed.)	1980	unavail.	unavail.	.	book	USCG	U
461	Coleshaw, Sue R K.	Motion sickness impedes evacuation.	h	Offshore Research Focus	issue 118	UK	25	Summary: A study for HSE by RGIT Ltd., assesses the range of anti-emetic medications and their suitability for treatment of personnel during EER from offshore installations.	magazine	Offshore Research Focus	U
651	Collins, Dahir and Madrzkowski.	Visibility of exit signs in clear and smoky conditions.	h	Fire Technology	1993	unavail.	unavail.	.	journal	USCG	U
579	Drabek, T.E.	Disaster evacuation behaviour: tourists and other transients	h	unavail.	1996	unavail.	unavail.	.	.	USCG	U
530	EQE International Inc	Study of human factors in offshore operations--EQE International Inc.	h	MMS	unavail.	Herndon, VA	unavail.	Summary: A study by EQE International Inc to define human factors that affect responses during normal and emergency operations on offshore platforms, then develop a methodology which can be used to	study	MMS Project 220	U

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								address both normal and emergency situations.			
676	Galbreath, M.	Time of Evacuation by Stairs in High Buildings	h	Ontario Fire Marshal, Vol. 5, No. 2	1969	unavail.	unavail.	.	journal	USCG	U
662	Gamer, Wilcox, England and Nakagawara.	Effects of cold exposure on wet air craft passengers.	h	unavail.	1994	unavail.	unavail.	.	book	USCG	U
559	Gil, B., and J. Yllera	A reference framework for the development and documentation of human reliability analyses (HRAs) for external events (fire) PSAs	h	PSAM IV	unavail.	unavail.	unavail.	.	journal	USCG	U
629	Green, C.H.	Risk; Beliefs and attitudes.	h	in: An Introduction, in Fires and Human Behaviour - Canter (ed.)	1980	unavail.	unavail.	.	book	USCG	U
610	Groner, Levin and Nelson.	Measuring evacuation difficulty in board and care homes.	h	Fire Journal	1981	unavail.	unavail.	.	journal	USCG	U
606	Haber, G.M.	Human behavior in fires in total institutions,	h	in: An Introduction, in Fires and Human Behaviour - Canter (ed.)	1980	unavail.	unavail.	.	book	USCG	U
596	Hall, J.M.	Fire safety decision making	h	Fire Technology	1995	unavail.	unavail.	.	journal	USCG	U
638	Harbst, J and Madsen, F.	The behavior of passengers in a critical situation on board a passenger vessel or ferry.	h	unavail.	1976	unavail.	unavail.	.	book	USCG	U
101	Hervey, G.R.	The physiology of survival at sea.	h	Science News, (Hardmonsworth)	1955, 38	unavail.	72-89	Summary: Special reference to cold climates and British Naval inflatable tented life-raft.	book	SPRI Pam 656.608	U
26	Hervey, G.R.	The physiology of survival at sea.	h	Science News, (Harmondsworth)	1955	unavail.	72-89	Summary: Special reference to cold climates and British Naval inflatable tented life-raft.	article	SPRI	U
675	Herz, E. et al	The impact of fire emergency training on knowledge of appropriate behaviour in fires	h	unavail.	1978	unavail.	unavail.	.	.	USCG	U
569	Horiuchi, Saburo	An overview of research on "people-fire interactions"	h	in: Fire Safety Science - Proceedings of the Second International Symposium	1978	unavail.	unavail.	.	proceedings	USCG	U
480	International Maritime Organization (IMO)	Report of the first session of the joint ILO/IMO ad-hoc working group on investigation of human factors in maritime casualties.	h	IMO	1997	London	unavail.	.	report	IMO Library IMO doc. FSI 5/WP.1	U
622	Janis, I.L.	Psychological effects of warnings.	h	in: Man and Society in Disaster, Baker and Chapman (eds.).	1962	unavail.	unavail.	.	book	USCG	U
636	Jenner, B.P.	Technical and human factors in the prevention and control of shipboard fires.	h	in: Fire Safety on Ships: Developments into the 21st Century	1994	unavail.	unavail.	.	book	USCG	U
634	Jennings, Charles	Socioeconomic characteristics and their relationship to fire incidence: A review of the literature.	h	Fire Technology	1999	unavail.	unavail.	.	journal	USCG	U

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302	Johnson, M.B.	Evacuation techniques for disabled persons : final report.	h	Springfield Environmental Research	1983	Ottawa	unavail.	Subjects: Architecture and the physically handicapped, Handicapped - Evacuation Work environment - Access for the physically handicapped.	final report	NEB NA2545/.P5/J6/Miche	U
664	Juillet, E.	Evacuating people with disabilities.	h	Fire Engineering	1993 Vol.126, No.12	unavail.	unavail.	.	journal	USCG	U
602	Kahn, M.J.	Human awakening and subsequent identification of fire-related cues.	h	Fire Technology	1984	unavail.	unavail.	.	journal	USCG	U
645	Keating, J.P.	The myth of panic.	h	Fire Journal	1982	unavail.	unavail.	.	journal	USCG	U
27	Keatinge, W.R.	Survival in cold water; the physiology and treatment of immersion hypothermia and of drowning.	h	Blackwell Scientific Publications	1969	Oxford and Edinburgh	131	Summary: Nature and scope of problem discussed and summary of recent experiments.	book	SPRI Shelf 612.52	U
588	Kimura, Michiharu, and Jonathan Sime	Exit choice behaviour during the evacuation of two lecture theatres	h	in: Fire Safety Science - Proceedings of the Second International Symposium	1978	unavail.	unavail.	.	proceedings	USCG	U
665	Lerup, L	Human behavior in institutional fires and its design complications.	h	unavail.	1978	unavail.	unavail.	.	book	USCG	U
617	Malone, Baker Kirkpatrick, Anderson, Bost, Williams, Walker and Hu.	Payoffs and challenges of human systems integration modelling and simulations in a virtual environment.	h	Naval Engineers Journal	1998	unavail.	unavail.	.	journal	USCG	U
648	Marcus, J.H.	Use of Object-Oriented Programming to simulate human behavior in emergency evacuation of an aircraft's passenger cabin.	h	unavail.	1997	unavail.	unavail.	.	report	USCG	U
49	McCance, R.A.; Ungley, C.C.; Crosfill, J.W.L. and Widdowson, E.M.	The hazards to men in ships lost at sea, 1940-44	h	His Majesty's Stationary Office, (Medical Research Council, Special Report Series, No.291.)	1956	London	44	Summary: Analysis of physiological aspects of survival at sea.	book	SPRI Pam 656.608	U
124	Mikolyuk, V.V.	The individual qualities of navigator in warning of accidents. (Russian)	h	Rybnoye Khozyaystvo	1989, 12	unavail.	65-66	Summary: Analyzes age of captains, mates and second mates in relation to the likelihood of warning of accidents, in case of Northern fishing fleet. Points out that recent reduction of captains' retirement age from 60 to 55 made no difference to captains in North, because concession replicates one of special privileges for those who work in North (argues that retirement age should be 50 for captains of North).	periodical	SPRI	U
630	Miller, Gerry.	Safety suggestions for passengers on cruise ships.	h	unavail.	1999	unavail.	unavail.	.	book	USCG	U
552	National Transportation Safety	Special Investigation Report: New York City Transit Authority subway system fires.	h	unavail.	1985	unavail.	unavail.	.	report	USCG	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
	Board										
668	Pauls, J.L.	Management and movement of building occupants in emergencies.	h	unavail.	1978	unavail.	unavail.	.	book	USCG	U
623	Pauls, J.L., Jones, B.K.	Research in human behavior.	h	Fire Journal	1980	unavail.	unavail.	.	journal	USCG	U
603	Paulsen, R.L.	Human behavior and fires: An introduction.	h	Fire Technology	1984	unavail.	unavail.	.	journal	USCG	U
529	Primatech, Inc	International workshop on use of human and organizational factors (HOF) in the management of safety and environmental hazards for offshore operations facilities.	h	MMS	1996	Herndon, VA	unavail.	Summary: Workshop was held 16-18 December, 1996. Studies have been initiated that emphasize human and organizational factors that affect responses during normal and emergency operations on offshore platforms. Offshore facilities provide a minimum of space for placement and operations of complex and densely configured drilling, production and processing equipment. Facility systems must be designed, arranged, operated, and inspected to minimize the potential for failure of any element. The failure of a single element in these tight quarters can cause a cascade of sequential failures, resulting in a catastrophic failure of the system.	book	MMS Project 250	U
616	Quarantelli, E.I.	Panic behavior: Some empirical observations.	h	in: Human response to tall buildings, D.J. Conway (ed).	1977	unavail.	unavail.	.	book	USCG	U
604	Ramachandran, G.	Human behavior in fires- A review of research in the United Kingdom.	h	Fire Technology	1990	unavail.	unavail.	.	journal	USCG	U
649	Ribbe, Jones and McCarthy.	Use of Video taped Peer Modelling in the acquisition of emergency coping skills: Active versus passive strategies.	h	Fire Technology	1995	unavail.	unavail.	.	journal	USCG	U
576	Safety at Sea	Crew and Passenger Behaviour	h	Safety at Sea	1994	unavail.	unavail.	.	.	USCG	U
652	Shehab, Schlegel and Palmerton.	A human factors perspective on human external loads.	h	unavail.	1998	unavail.	unavail.	.	book	USCG	U
639	Sime, J.D.	The concept of panic.	h	in: An Introduction, in Fires and Human Behaviour - Canter (ed.)	1980	unavail.	unavail.	.	book	USCG	U
672	Snell, J.E. et al	Summary Preliminary Report of the Advisory Committee on the Toxicity of the Products of Combustion	h	unavail.	1984	unavail.	unavail.	.	report	USCG	U
571	Stahl, F.I.	BFIRES-II: A behaviour based computer simulation of emergency egress during fires	h	Fire Technology	1982	unavail.	unavail.	.	journal	USCG	U
681	Stahl, F.I.	B Fires II: A behaviour-based computer simulation of emergency egress during fires	h	Fire Technology, May	1982	unavail.	unavail.	.	periodical	USCG	U
670	Stahl, F.I.	Simulating human behavior in high-rise building fires: modeling occupant movement through a fire floor from initial alert to safety egress	h	unavail.	1975	unavail.	unavail.	.		USCG	U
663	Stringer, P. and Canter,	Environmental interaction: Psychological approaches to our	h	unavail.	unavail.	unavail.	unavail.	.	book	USCG	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
	D.	physical surroundings.									
678	Tadahisa, Jin, and Tokiyoshi Yamada	Experimental study of human behaviour in smoke filled corridors (in Fire Safety Science - Proceedings of the 2nd International Symposium)	h	in: Fire Safety Science - Proceedings of the Second International Symposium	unavail.	unavail.	unavail.	.	proceedings	USCG	U
677	Transit Cooperative Research Program	Transit Operations for Individuals with Disabilities	h	Transit Cooperative Research Program	1995	unavail.	unavail.	.	.	USCG	U
9	Turpin Consultants	Performance-based Ergonomic Criteria and Evaluation Standards for Offshore Rig Evacuation Systems: Phase 1	h	Prepared for Transportation Development Centre, Transportation Systems Technology, Transportation	1999, July	Canada	29	Summary: The focus of this study was to develop performance-based ergonomic criteria to evaluate semi-wet evacuation systems used on offshore rigs. The continuum of evacuation systems covers the moment a decision has been made to evacuate the platform, to the point when personnel are about to board the rescue vessel. The ergonomic factors derived from the literature, which comprised the ergonomic performance-based criteria, were categorized into the following areas; management, training, procedures, information and communication, and environmental factors. A table was developed that identified the stage of evacuation for which the ergonomic factors are relevant, the appropriate references, information still required, and the performance-based criteria against which evacuation systems could be evaluated. It will be critical to ensure that future work entails an ergonomic analysis of the task of "using" an evacuation system (....) Several recommendations were made that addresses the need for a comprehensive review and analysis of ergonomic requirements of evacuation systems.	study	Bercha	U
560	Wood, P.G.	A survey of behaviour in fires, an introduction	h	in: Fires and Human Behaviour - Canter (ed.)	1980	unavail.	unavail.	.	book	USCG	U
605	Yoon, Sugahara and Kishitani.	Human behavior in emergency egress of building fires.	h	in: Fire Safety Science - Proceedings of the Second International Symposium	unavail.	unavail.	unavail.	.	proceedings	USCG	U
558	Zhao, L.	A new approach for modeling the occupant response to a fire in a building	h	Journal of Fire Protection Engineering	unavail.	unavail.	unavail.	.	journal	USCG	U
462	Brodie, P.R.	Dictionary of shipping terms. 3rd ed.	m	Lloyd's of London Press	1997	London	unavail.	.	dictionary	IMO Library ISBN: 1-85978-119-5	U
463	Hughes, C.	Dictionary of marine technology.	m	Lloyd's of London Press	1997	London	unavail.	.	dictionary	IMO Library ISBN: 1-85978-136-5	U
464	Ivanov, A.	Dictionary of shipping terms : Russian/English : English/Russian.	m	Lloyd's of London Press	1997	London	unavail.	.	dictionary	IMO Library ISBN 1-85978-073-3	U
536	Offshore Technology - Industry Associations - Canada	The website for the offshore oil & gas industry.	m	Offshore Technology - Industry Associations - Canada	2000	World Wide Web	12	Summary: This website provides a listing of industries and organizations involved in the offshore oil and gas industry in Canada.	internet	www.offshore-technology.com	U
55	Smirnov, v.	The lighter needs a taxiing system. (Russian)	m	Morskoy Flot	1987, 12	unavail.	:48	Summary: Discusses lighter safety and argues for a "taxiing system" for lighters, with particular reference to nuclear lighter Sevmorput". Author is captain of Sevmorput".	periodical	SPRI	U
162	Vorob'yev.	Nuclear plant safety. Sevmorput	m	Soviet Shipping	1989, 9(3)	unavail.	26-28	Summary: Describes briefly advantages of nuclear icebreakers and	perio	SPRI	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
	V. and Rodionov, N., alias: Vorobyov, V.	LASH containership.						subsequent development of atomic icebreaking transport Sevmorput'. Discusses safety and ecological aspects of power plant and argues that Sevmorput' is most reliable and safe reactor type. Lists safety criteria and gives examples of hypothetical accidents and their potential effects.	dical		
28	Wallace, Wayne and LaBree, Laurie	The effect of tubing length, gas flow, and number of heaters on maximum gas temperature for aerosol circuited used for cold water near - drowning or hypothermia	m	Alaska Medicine	1999	Alaska	53-55	Summary: Examines interaction between factors affecting temperature to which gases can be heated in method routinely used in treatment of patients suffering from hypothermia or cold-water near-drowning.	periodical	SPRI	U
317	.	Northern marine pipeline control technology.	n	Moneco Consultants Limited	1987	Calgary, Alberta	unavail.	.	book	NEB TN879.5/N67	U
223	Andersen, Hakon With.; Collett, John Peter.	Anchor and balance : Det Norske Veritas, 1864-1989	n	Cappelens	1989	Norway	unavail.	Subjects: Norske Veritas (Organization) - History insurance, Marine - Norway - History Shipping - Norway -History.	book	NEB HE969/.N6/A63	U
64	Anon.	Report: Assessment of Northern Sea Route potential.	n	Arctic News-Record	1992, 8(4)	unavail.	2-6	Summary: Report of symposium on commercial and technical aspects of Northern Sea Route (NSR), organized by Nordic Navigation Forum in Tromso in April 1992.Topics covered are design of icebreakers, incidents of damage to ships, insurance and other costs and potential for profitable use of NSR.	periodical	SPRI Pam (*54)[1992]	U
65	Anon.	Soviet Union faces domestic pressure to reduce Arctic operations.	n	New Scientist	1989, 124(1694)	unavail.	:20	Summary: Concern about effects, on region and people, of nuclear tests in Soviet Arctic in 1950s. Complaints by reindeer-herding Nenrsy (who were moved from Novaya Zemlya to mainland in 1956) that, as a result of exposure to radioactive fallout from 33 years of tests, incidence of cancers among them is abnormally high, that food eaten by reindeer is contaminated, and that mining and research activities are disrupting their traditional way of life. Safety and integrity of Soviet submarines that patrol under icecap, and economics of research stations in region, have also been questioned.	periodical	SPRI Pam (*50):323.1[Nentsy]	U
32	Anon.	Warm relationships in cold ice.	n	Soviet Shipping	1987	unavail.	:32	Summary: Account of meeting in Leningrad of icebreaker service divisions of USSR, Finland, Sweden, Denmark and FRG to review Matters of cooperation in icebreaker shipping support in Baltic Sea.	periodical	SPRI	U
71	Armstrong, Terrance Edward.	Northern Sea Route operations in the 1986-87 season. In: Brigham, Lawson W., ed. The Soviet Maritime Arctic.	n	Belhaven Press in assoc. with the Scott Polar Institute	1991	London	150-157	Summary: Gives overview of Soviet icebreakers and other vessels in use, and also operations in Kara, Laptev, east Siberian and Chukchi Seas. Gives examples of problems come to light as result of glasnost. Outlines ice conditions for same period.	book	SPRI Shelf (*68)[1991]	U
36	Bogorodskiy, V.	To whom should fate of the nuclear fleet be entrusted? Discussion of a sore point. (Russian)	n	Morskoy Flot	1989, 6	unavail.	6-7	Summary: Discusses safety of Soviet nuclear powered fleet (icebreakers Lenin, Arktika, Sibir' and Rossiya, lighter Sevmorput' and group of support vessels) in light of Chernobyl' disaster. Criticizes low qualification of crews and absence of hard-currency payments to them. Criticizes lack of medical and other facilities for crews on these ships. Appended editorial note draws attention to Ministry's plans tp change negative phenomena cited.	periodical	SPRI	U
84	Churchill, Robin R. and Ulfstein, Geir.	Marine management in disputed areas: the case of the Barents Sea.	n	Routledge	1992	London	182	Summary: Book aims to provide legal basis for resource management in Barents Sea, which is rich in fish and possibly oil and gas. Important question is whether Svalbard Treaty applies, and if so, where. Introduction defines sea, describes its oceanography, geography, history of exploration, ice conditions, populations living or working around it, hunting of sea mammals, results of over-fishing and hunting, naval and straiegic significance, special role of Norway, transport (also by air), tourism and research. Discusses status of Mining Code with	book	SPRI Shelf(*686):341.225	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
								respect to various types of zone and Russo-Norwegian ad hoc "Grey Zone Agreement". Gives details of catches, mentions flaws in official statistics and failures in enforcement, with look at possibility of controlling pollution, more likely in case of Norway.			
86	Daley, C.G.; Ferregut, C. and Brown, R.	Structural risk model of Arctic shipping. In: Jones, Stepheen J.; McKenna, Richard F.; Tiloston, Joy and Jordaan, Ian J., eds. Ice-Structure Interaction. IUTAM/IAHR Symposium, St. John's, Newfoundland Canada 1989.	n	Springer-Verlag	1991	Berlin	509-540	Summary: Risk analysis model has been developed, focusing on computer program Arctic Shipping Probability Evaluation Network (ASPEN)Parameters include: environmental definition navigation and ice avoidance process (including human behavior), ship/ice collision mechanics, and structural limit states (failure mechanics). All aspects are variable and should be treated statistically. Discussion, p. 537-540.	book	SPRI Shelf 624.145	U
91	Eriksen, Viking Olver.	Sunken nuclear submarines: a threat to the environment?	n	Norwegian University Press	1990	Oslo	176	Summary: Examines some of ca. Accidents known to involve nuclear submarines and assesses environmental consequences. Argues need for greater openness.	book	SPRI Shelf 629.127	U
98	Handler, Joseph.	Preliminary report on: Greenpeace visit to Vladivostok and area around the Chazma Bay and Bolshoi Kamen submarine repair and refueling facilities, 9-10 October 1991.	n	Greenpeace	1992	Washington, D.C.	19	Summary: Describes nuclear-powered submarine facilities in Vladivostok area, Greenpeace's October 1991 visit, major nuclear submarine accident in 1985, other submarine accidents, submarine refueling, decommissioning and radioactive waste disposal and contamination. Includes selected press clippings.	book	SPRI Shelf (*50):504.06[Greenpeace]	U
99	Handler, Joshua and Sprange, John.	Preliminary report on: Greenpeace visit to closed city of Severodvinsk, 1-2 October 1991.	n	Greenpeace	1991	Washington, D.C.	6	Summary: Preliminary report on: Greenpeace visit to Severodvinsk, and problems of liaison between city's civilian authorities and Navy staff at major nuclear submarine building and repair yards. Describes radioactive contamination, waste disposal, decommissioning of nuclear submarines, and nuclear accidents.	book	SPRI Shelf (*50):504.06 [Greenpeace]	U
100	Hauge, Fredric; Nilsen, Thomas and Nilsen, Knut E.	Dumping of radioactive waste in the Barents- and Kara Seas.	n	Bellona Foundation	1992, No.3:92	Oslo	31	Summary: Presents results of survey covering 1965-92. Includes source and type of radioactive material, both civilian and naval, dumping sites, and dumping of contaminated water.	book	SPRI Shelf (*68):504.054:621:039	U
102	Hollister, Charles d., ed.	Trip report. St Petersburg and Moscow, Russia,, September 20-25, 1992.	n	Woods Hole Oceanographic Institution.	1992	Woods Hole	52	Summary: Account of visit by US delegation including representatives of Woods Hole Oceanographic Institution, National Academy of Sciences Board on Radioactive Waste Management and Newport News Shipbuilding, to discuss joint work with Russians in developing marine deep-water radiation and environmental monitoring system. Appendices include programme, agenda, names and positions of participants and protocol on intentions of cooperation on issues related to development of marine radiation and environmental monitoring systems.	book	SPRI Pam 061[Woods Hole Oceanographic Institution]	U
41	Ignitskiy, R and Smirnov, A.	A new fleet is needed to suit new conditions. (Russian)	n	Morskoy Flot	1988, 6	unavail.	28-30	Summary: Discusses accident rate of shipping on Northern Sea Route, especially caused by lack of durability of vessels relative demands of area where used, poor construction, lack of ice training, etc. Alleges total inadequacy of ports, communications, technical equipment on ships, informational systems. Accompanying editorial comments describes article as containing "excessive emotion."	periodical	SPRI	U
105	Ignitskiy, R. and Smirnov, A.	A new fleet is needed to suit new conditions. (Russian)	n	Morskoy Flot	1988, 6	unavail.	28-30	Summary: Discusses accident rate of shipping on Northern Sea Route, especially as caused by lack of durability of vessels relative to demands of area where used, poor construction, lack of ice training, etc. Alleges total inadequacy of Route's ports, communications, technical equipment on ships, informational systems. Accompanying editorial comment describes article as containing "excessive emotion".	periodical	SPRI	U
111	Karavanov,	Ice damages of transport ships and	n	Ship & Ocean	1996	Tokyo	187-188	Summary: Brief report on study assessing operational hull state of	book	SPRI Folio (*54):061.3[1995]	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
	S.B. Stanislav, B. and Glebko, Yuri V.	icebreakers on NSR. In: Fujita, Yuzuru and Kitagawa, Hiromitsu, ed. Northern Sea Route: Future and Perspective. The proceedings on INSROP symposium Tokyo '95 (1-6 October 1995).		Foundation				ships and icebreakers using Northern Sea Route			
46	Kosmovich, Ye.	What has changed in the course of a year? (Russian)	n	Morskoy Flot	1988, 5	unavail.	16-17	Summary: Returns to authors complaints about servicing of Northern Sea Route ships (supplies, shore-side service, ship repair) published in Morskoy Flot 1987 (5). Observes what has changed and what has remained unchanged. Turns attention to safety issues on Northern Sea Route.	periodical	SPRI	U
300	Newell, J.P.; Davidson, L.W.	Regional marine climate comparisons for offshore drilling locations worldwide.	n	Atmospheric Environment Service	1986	Ontario	unavail.	Subjects: Oil well drilling, Submarine - Climatic factors.	book	NEB QC980.15/C3/no.86-18	U
132	Nilsen, Thomas.	Nuclear-powered icebreakers.	n	Bellona Foundation	1993, No1:93	Oslo	24	Summary: Describes non-military icebreakers of Murmansk Shipping Company, including reactor breakdown on /Lenin/n, possible alternative uses for vessels, and dumping of radioactive waste. Section on "Atomflot" base describes dangers storing accumulated fuel elements on ships at base, and arrangements for dumping at sea or transport to Mayak reprocessing plant.	book	SPRI Shelf (*68):504.054:621:039	U
133	Nilsen, Thomas.	The nuclear problems in connection to the Russian North Fleet.	n	Bellona Foundation	1993, No2:93	Oslo	29	Summary: Describes Naval surface vessels and submarines, suggests possible reactor design, and lists nuclear accidents from early 1960's to present. Section on storage and processing of nuclear waste.	book	SPRI (*68):504.054:621.039	U
52	Plotkinov, K.	The icebreaker fleet: services and incentives. (Russian)	n	Morskoy Flot	1987, 8	unavail.	5-7	Summary: Discusses charges for using icebreakers in Soviet waters, especially Northern Sea Route, effect of these charges on pay and safety. Proposes restructuring af charge system. Article followed by editorial commentary discussing proposals.	periodical	SPRI	U
134	Polunin, F.	Speed, radio, link, discipline...(Russian)	n	Morskoy Flot	1988, 10	unavail.	25-28	Summary: Addresses certain questions of tactics of ice navigation on Northern Sea Route. Discusses reasons for ice-navigation accidents. Intended as a practical guide. List of maxims printed under title refers to content of article: "Stopping at nothing or going in little hops? The more gently you go, the more chance of getting stuck. Ice-splinter or the tip of an iceberg? The radiotelephone is not for marine harassment. Energy is mass multiplied by speed".	periodical	SPRI	U
136	Ries, Tomas.	Russian nuclear reactors in the Nordic region.	n	Jane's Intelligence Review.	1993, 5(8)	unavail.	360-364	Summary: Provides overview of location and condition of Soviet reactors in Barents and Kara Seas, and generalized description of accidents and pollution caused. Includes list of nuclear submarine and icebreaker accidents between 1961-91.	periodical	SPRI Pam (*50):504.054:621.039	U
139	Sandkvist, Jim.	Impact assessment and contingency planning remote operations, including Swedish case. In: Simonsen, Henning, ed. Proceedings from the Northern Sea Route Expert Meeting 13-14 October 1992 Tromso, Norway	n	Fridtjof Nansen Institute	1993	Lysaker	93-107	Summary: Presents example of Swedish icebreaker Oden illustrating environmental impact assessment as focused on ship. Describes measures relating to normal operations as well as emergency procedures. Discusses preventative measure required to minimize environmental impact.	book	SPRI Shelf (*54):061.3	U
141	Semanov, G.N.; Kirsh, Y.B. and Grachyova, O.B.	The NSR oil spill contingency plan.	n	INSROP Working Paper	1999, 129	unavail.	1-106	Summary: INSROP Sub-programme II: Environmental Factors. Comprehensive report on different components of NSR Oil Spill Contingency Plan: response area and risk assessment; operation control headquarters; appointment of experts; receiving and transmitting information; combating oil spills; safety measures; training exercises; procedures for recording costs and their recovery.	periodical	SPRI	U
143	Smirnov, A.P., ed.	Safety of navigation through ice (Russian)	n	Transport	1993	Moskva	335	Summary: Handbook on ice navigation. Outlines main properties of sea ice and methods of transmitting information on ice conditions.	book	SPRI Shelf 656.61.052:551.326(pub.1993	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
								Describes various types of icebreakers and ships designed for navigation through ice. Explains independent navigation of freighters through ice and convoy navigation. Includes details of shipping coastal ice conditions. Makes recommendations on ways to reduce accidents at sea. Includes international symbols for ice charts.		]	
144	Smirnov, V.I	Ice conditions in terms of ship handling in the Pacific Ocean ice massif in winter.	n	Polar Geography and Geology.	1989, 13(3)	unavail.	196-204	Summary: Discusses ice characteristics (concentrations, age, thickness, snow depth, and amount of ridging) during icebreaker Vladivostok's entire track during July to August 1985, from entrance into to emergence from ice, having freed Mikhail Somov. Incidences of icebreaker becoming jammed, suffering accretion on hull, and being nipped in ice are also analyzed. Tactics used by captain in reaching , freeing, and escorting Mikhail Somov to open water are discussed.	periodical	SPRI	U
145	Smirnov, V.I.	Ice conditions in terms of ship handling in the Pacific Ocean ice massif in winter. (Russian)	n	Sovetskaya Antarkticheskaya Ekspeditsiya. Informatsionnyy Byulleten'.	1989, 112	unavail.	56-64	Summary: Discusses ice characteristics (concentrations, age, thickness, snow depth, and amount of ridging) during icebreaker Vladivostok's entire track during July to August 1985, from entrance into to emergence from ice, having freed Mikhail Somov. Incidences of icebreaker becoming jammed, suffering accretion on hull, and being nipped in ice are also analyzed. Tactics used by captain in reaching , freeing, and escorting Mikhail Somov to open water are discussed.	periodical	SPRI	U
147	Somkin, V.; Ilyscenko-Krylov, D and Lastochkin, P.	NSR shipboard oil pollution emergency plan.	n	INSROP Working Paper	1996, 65	unavail.	1-13	Summary: INSROP Sub- Programmme II: Environmental Factors. Examines international instructions and national regulations and instructions relating to shipboard oil pollution emergency plan. Appendices list factors affecting oil pollution prevention in high latitudes, and results of ship survey. Includes useful contacts.	periodical	SPRI	U
149	Sven, Hans Erik.	Voyages of Arctic convoys round the Cape of Kola. (Norwegian)	n	Polarboken	1989-90	unavail.	68-94	Summary: History of World War II convoys of Russian Murmansk area round North Cape, including wide range of information on types of ships involved, enemy submarines, air cover, bombers, routes taken, and other relevant information.	periodical	SPRI	U
540	US Coast Guard Marine Safety and Environmental Protection Directorate	Making the outer continental shelf a safer place to work. In: Marine Safety Newsletter, January 2000.	n	National Maritime Centre	2000 Jan.	World Wide Web	16	Summary: A safety newsletter put out by the National Maritime Centre.	internet	Marine Safety Newsletter, National maritime Centre	U
57	Watson, Gordon G.	Technical aspects of ice navigation and port construction in Soviet Arctic. In: Brigham, Lawsen W., ed. The Soviet Maritime Arctic. London: Belhaven Press in assoc. with the Scott Polar Institute, 1991, (Polar Research Series.)	n	Polar Research Series	1991	UK	158-176	Summary: Describes various types of convoy formations with their advantages and disadvantages: single-file ice convoy, convoy in echelon, short tow operating in rivers and estuaries and tow in tandem. Gives details of recent improvements in ship construction with particular reference to Medyug conversion to Thyssen/Waas bow and icebreaking-clearing attachment. Other topics covered are: berthing in coastal ice belt; building jetties. Discusses prospects for international use of Northern Sea Route in view of technical developments.	book	SPRI Shelf(*68)[1991]	U
168	Yemel'yanenkov, A.F.	Secret records of the nuclear archipelago. (Russian)	n	Trudy	1993 2(1.1)	Morskaya Arkticheskaya Kompleksnaya Ekspeditsiya	96-107	Summary: Examines development of "Objective 700" and establishment of nuclear test site in 1950's, and testing in 1960's. Includes details of dumping of radioactive waste by "Atomflot" and sites of dumped nuclear reactors. Discusses anti-nuclear campaign in Arkhangel'skaya Oblast'.	book	SPRI Shelf (*526)[1993]	U
316	Zakrzewski, W.P.; Lozowski, E.P.	Soviet marine icing data.	n	Atmospheric Environment Service	1989	Ontario	unavail.	.	book	NEB QC980.15/C5/no.89-2	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
292	.	Working the offshore safely [video recording]	p	[s.l]	1986	Canada	unavail.	Subjects: Oil well drilling, Submarine - Safety measures Offshore oil industry - Canada - Safety measures. Notes: VHS. Time: 10 minutes.	video	NEB TN873/.C32/W67	U
251	.	Recommended practices/guidelines for evaluation of mobile offshore drilling unit (MODU) emergency power systems and fire protection systems.	p	American Petroleum Institute	1988	Washington, D.C.	unavail.	.	report	NEB API/RP/62/1988	U
263	.	Recommended practice for orientation program for personnel going offshore for the first time.	p	American Petroleum Institute	1986	Washington, D.C.	unavail.	.	book	NEB API/RP/T-1/1986	U
279	.	Recommended practice for design, construction, operation and maintenance of offshore hydrocarbon pipelines.	p	American Petroleum Institute	1976	Washington, D.C.	unavail.	.	book	NEB API/RP/1111/1976	U
284	.	Recommended practice for installation, maintenance and repair of subsurface safety valves and underwater safety valves offshore.	p	American Petroleum Institute	1991 3rd ed.	Washington, D.C.	unavail.	.	book	NEB API/RP/14H/1991	U
285	.	Recommended practice for planning, designing and constructing fixed offshore platforms.	p	American Petroleum Institute	1991 19thed.	Washington, D.C.	unavail.	.	book	NEB API/RP2A/1991	U
751	.	Stability information booklet	p	Marystown Shipyard Limited	1985 March	unavail.	unavail.	Subject: CCGS Mary Hichens 64 metre search and rescue vessel.	information booklet	FTL	U
752	.	General arrangement drawing of the CCGS Mary Hichens. Sheet 1 of 1, revision 0 11 March 1988.	p	Marystown Shipyard Limited	1988	unavail.	unavail.	.	drawing	FTL	U
282	.	Training and qualifications of personnel in well-control equipment and techniques for drilling on offshore locations.	p	Minerals Management Service	1982	Reston, Va.	unavail.	.	book	NEB TN871.2/T7	U
235	.	Safety and offshore oil.	p	National Academy Press	1981	Washington, D.C.	unavail.	Subjects: Oil well drilling, Submarine - Safety measures	book	NEB TN871.35/A7	U
599	.	Fire safety on ships: developments into the 21st Century	p	unavail.	1994	unavail.	unavail.	.	.	USCG	U
646	.	The prevention and control of fires in ships.	p	unavail.	1972	unavail.	unavail.	.	book	USCG	U
484	American Bureau of Shipping (ABS)	Safer ships competent crews - International conference (24-25 October 1996 : Halifax, Nova Scotia)	p	ABS	1997	New York	unavail.	.	book	IMO Library ISBN 0-943878-24-0	U
243	American Petroleum Institute.	Recommended practice for analysis, design, installation, and testing of basic surface safety systems for offshore production platforms.	p	American Petroleum Institute	1998	Washington, D.C.	unavail.	.	report	NEB API/RP/14C/1998	U
667	BHR Group.	Management and engineering of fire safety and loss prevention: Onshore and offshore.	p	BHR Group, Ltd.	1991	unavail.	unavail.	.	report	USCG	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
577	Bukowski, R.W., and V. Babrauskas	Developing rational, performance-based fire safety requirements in model building codes	p	Fire and Materials, Vol. 18	1994	unavail.	unavail.	.	journal	USCG	U
635	Davies, A.D.	Some tolls for fire model validation.	p	Fire Technology	1987	unavail.	unavail.	.	journal	USCG	U
20	Edholm, Otto Gustaf and Bacharach, A.L., eds.	Exploration medicine: being a practical guide for those going on expeditions.	p	John Wright	1965	Bristol	410	Summary: Includes chapters on problems of survival, cold climates, small boats at sea, rations.	book	SPRI Shelf 613/614	U
485	Fuller, J.F.C.	A Changing approach to safety. In: Nautical Institute Commercial management for shipmasters : A practical guide.	p	The Nautical Institute	1996	London	159-171	.	book	IMO Library	U
293	Funge, William J.; Chang, Kai S.; Juran, David I.	Offshore pipeline safety practices.	p	Dept. of Transportation	1977	Washington, D.C.	unavail.	.	Mfiche	NEB TN879.5/F87/Mfiche	U
472	Gratsos, G.A.	Bulk carrier safety. In : Hellenic Chamber of Shipping Review.	p	Hellenic Chamber of Shipping Review.	1997 Vol. 145	unavail.	133-144		periodical	IMO Library	U
488	International Maritime Organization (IMO)	Optimum maritime safety demands a focus on people : World Maritime Day 1997	p	IMO	1997	London	unavail.	.	book	IMO Library	U
477	Kvamsdal, R./ Forde, I.M.	Safe and efficient ships : Friendly to the environment. In: Institute of Marine Engineering Safe and efficient ships : New approaches for design operation and maintenance - ICMES 96 : International Conference on Marine Engineering Systems (13-14 June 1996).	p	The Institute of Marine Engineers	1996	London	11-17	.	periodical	IMO Library	U
497	Link Associates International LTD	Ensuring effective training for implementation of the safety management system. In: IIR Ltd Developing, implementing and auditing marine safety systems to ensure compliance with the ISM Code - Conference (10-11 March 1997 : London).	p	IIR Ltd	1997	London	unavail.	.	conference proceedings	IMO Library	U
509	Moxie Media Inc.	Avoiding slips, trips and falls in the offshore oil industry.	p	Moxie Media Inc.	unavail.	New Orleans, LA	unavail.	Summary: Hosted by a leading safety expert on the subject who instructs offshore personnel on production platforms, drilling rigs and maritime vessels about how to prevent injuries and fatalities from the leading cause of accidents in all industries - slips, trips and falls. Proper shoe wear, awareness, slipping and tripping hazards, housekeeping, physical conditioning and ergonomic engineering are all covered in this eye opening presentation. (30 min)	video	(OFF-Slip/Trip	For Sale
510	Moxie Media Inc	Safe line handling practices and procedures.	p	Moxie Media Inc.	unavail.	New Orleans, LA	unavail.	Summary: Explains techniques and hazards of line handling procedures for offshore service vessels and crews. Docking, mooring, anchor handling, towing and hip toeing procedures are all demonstrated. *Module I* - Safe Docking and Mooring Procedures (OFF-SafLineHand 1). *Module II* - Safe Rig Towing and Hip Towing (OFF-	video	Moxie Media Inc	For Sale

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
								SafLineHand 2). Module III Safe Anchor Handling (OFF-SafLineHand 3).			
511	Moxie Media Inc.	Body in motion: A guide to employee wellness and safety for the offshore oil and maritime industries.	p	Moxie Media Inc.	unavail.	New Orleans, LA	unavail.	Summary: This program, hosted by one of the leading back safety and injury prevention consultants in the country, Dr. Rick Bunch, covers the specific safe work practices required for offshore personnel to work injury free in the oilfield environment. It includes proper lifting techniques, posture relief methods, preventative stretching and strengthening exercises and instruction on how to make offshore workers begin to work smart - utilizing ergonomic principles of lifting, pushing and pulling. Shot on drilling rigs, production platforms and supply vessels. Module I- Guide to Employee Wellness and Safety (5 min). Module II On-The-Job Stretching and At-Home Strengthening Exercises (15 min). Module III Preventative Maintenance: Understanding the Mechanics of Your Back and Body (12 min). Module IV Basics of Lifting and Working Smart (15 min). Module V Ergonomic Task and Site Specific Instructions on Safe Work Practices for Offshore Employees (20 min).	video	Moxie Media Inc OFF-BkSf	For Sale
512	Moxie Media Inc.	Fire prevention and response for the offshore oil industry.	p	Moxie Media Inc.	unavail.	New Orleans, LA	unavail.	Summary Fire aboard an offshore installation, rig or platform is one of the greatest dangers personnel may have to face at their isolated maritime location. Topics include the elements of fire, fire extinguishers and usage, fire prevention through housekeeping and maintenance, response plans and incipient duties, alarms, the station bill, and the importance of realistic drills.	video	Moxie Media Inc	For Sale
513	Moxie Media Inc.	Hydrogen Sulfide (H2S) safety for the offshore industry.	p	Moxie Media Inc.	unavail.	New Orleans, LA	unavail.	Summary: Addresses the precautions that must be taken specifically for working in an offshore environment in which H2S may be present. The characteristics of H2S, its hazards, the effects and symptoms of exposure and the necessary engineering controls are all covered in this comprehensive video. Also included are modules on gas detection equipment, respirator systems and emergency response procedures.	video	Moxie Media Inc	For Sale
523	Moxie Media Inc.	Protective clothing and equipment.	p	Moxie Media Inc.	unavail.	New Orleans, LA	unavail.	Summary: This program covers the different types of protective clothing and equipment as well as the advantages and disadvantages of each type. Respiratory protection, including self-contained breathing apparatus (SCBA) and supplied air respirators (SAR), is studied. The viewer is warned about the dangers of degradation, penetration and permeation. (22 min)	video	Moxie Media Inc EFG-ProtClEq8Step4	For Sale
761	Texas Engineering Extension Service	TEEX Centre for Marine Safety and Training.	p	TEEX	unavail.	United States	4	Summary: The TEEX Centre for Training and Safety website covers the following areas: training, products, programs, services, and resources. The Centre for Marine Training and Safety provides mariners with courses that are customized to the Oceangoing Maritime Industry specifications and regulatory requirements. All courses are designed to exceed the International Maritime Organization's (IMO) recommendations for Seafarer's Training, Certification, and Watchkeeping (STCW) code and have received the approval of the U.S. Coast Guard where appropriate. Our basic safety training courses are also recommended by the Norwegian Oil Association.	world wide web	TEEX	U
546	The College of Fisheries, Navigation, Marine Engineering and Electronics	Marine and safety training in the Eastern Canadian offshore petroleum industry : executive summary	p	The College of Fisheries, Navigation, Marine Engineering and Electronics	1984	St. John's NFLD	151	.	book	UofC GV838.74.L53	U
455	Transport	Marine emergency duties training	p	Transport Canada	unavail.	Canada	173	Summary: *Scope and Application:* The International Convention on	book	Transport Canada	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
	Canada	programme. TP4957E						Standards of Training, Certification and Watchkeeping for seafarers (STCW), 1978 as amended in 1995 provides standards regarding emergency, occupational safety and survival functions in Chapter VI of the mandatory Code "A". Compliance with requirements of the above standards to meet mandatory minimum requirements for familiarization, basic safety training and instructions for all seafarers; and training in advanced fire fighting for seafarers designated to control fire fighting operations and sufficient knowledge to launch and take charge of a survival craft in emergency situations. *Goals:* to provide seafarers with an understanding of the hazards associated with the marine environment and their vessel. To provide training in skills required to cope with such hazards to an extent appropriate to their functions on board in shore based approved training courses.			
549	Transportation Safety Board of Canada	A safety study of the operational relationship between ship masters/watchkeeping Officers and marine pilots	p	Transportation Safety Board of Canada	1995	Hull, QB	48	.	book	UofC CA1 /Z 1/84016R02B	U
545	United States Lifesaving Association	Life saving and marine safety / United States Lifesaving Association.	p	Association Press : New Century Publishers	1981	Piscataway, NJ	256	Subject: Lifeguards--Training of, Life-saving--study and teaching	book	UofC KF3574 .M37 C36	U
358	.	AODC and DMAC Guidance Notes (Volume 2)	r	.	1987, Vol. 2	.	unavail.	*Summary of Guidance Notes (Vol. 2):* IMCA diving division guidance note no.: IMCA D 002 - battery packs in pressure housings IMCA diving division guidance note no.: IMCA D 003 - OXY - ARC cutting operations underwater IMCA diving division guidance note no.: IMCA D 004 - the initial and periodic examination, testing and certification of hyperbaric evacuation launch systems IMCA diving division guidance note no.: IMCA 005 - auditing of IMCA training courses for diving personnel IMCA training courses for diving personnel IMCA diving division guidance note no.: D 007 - overboard scaffolding operations and their effect on diving safety IMCA diving division guidance note no.: D 008 - testing of through water communications AODC diving division guidance note no.: AODC 018 (rev 1) - attachment of loads to lifting hooks during diving operations IMCA guidance note no. IMCA D 010 - diving operations from vessels operating in dynamically positioned mode (rec'd 12/18/96) rec'd guidance note no. DMAC # 20 & # 28 - 98/01/16.	book	C-NOPB VM981A1A8 Vol. 2 1987	U
389	.	AODC and DMAC Guidance Notes (Volume 1)	r	.	1987, Vol. 1	.	unavail.	*Summary of Guidance Notes (Vol. 1):* IMCA diving division guidance note no.: IMCA D 002 - battery packs in pressure housings IMCA diving division guidance note no.: IMCA D 003 - OXY - ARC cutting operations underwater IMCA diving division guidance note no.: IMCA D 004 - the initial and periodic examination, testing and certification of hyperbaric evacuation launch systems IMCA diving division guidance note no.: IMCA 005 - auditing of IMCA training courses for diving personnel IMCA training courses for diving personnel IMCA diving division guidance note no.: D 007 - overboard scaffolding operations and their effect on diving safety IMCA diving division guidance note no.: D 008 - testing of through water communications AODC diving division guidance note no.: AODC 018 (rev 1) - attachment of loads to lifting hooks during diving operations IMCA guidance note no. IMCA D 010 - diving operations from vessels operating in dynamically positioned mode (rec'd 12/18/96) rec'd guidance note no. DMAC # 20 & # 28 - 98/01/16.	book	C-NOPB VM981A1A8 Vol. 1 1987	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
247	.	Regulations respecting safety, conservation practices and the prevention of pollution in operations undertaken for the production of petroleum offshore Nova Scotia.	r	[s.l. : s.n.]	1993	Canada	unavail.	Subjects: Offshore oil industry - Law and legislation - Newfoundland	gov't docs	NEB V.F. Canada. Nova Scotia Offshore Petroleum Production and Holdings	U
248	.	Canadian offshore petroleum industry : qualifications, safety training and certification (drilling).	r	[s.l. : s.n.]	1990	Canada	unavail.	.	book	NEB TN871;3/C35	U
257	.	Regulations respecting safety, conservation practices and the prevention of pollution in operations undertaken for the production of petroleum offshore Newfoundland.	r	[s.l. : s.n.]	1993	Canada	unavail.	Subjects: Offshore oil industry - Law and legislation - Newfoundland	gov't docs	NEB V.F. Canada. Newfoundland Offshore Petroleum Production	U
291	.	Regulations respecting the issuance of certificates of fitness for offshore oil and gas production, drilling accommodation and diving installations.	r	[s.l. : s.n.]	1994	Canada	unavail.	.	gov't docs	NRB V.F. Canada. Canada Oil and gas Certificate of Fitness	U
270	.	Rules for building and classing mobile offshore drilling units.	r	American Bureau of Shipping	1985	New York, N.Y.	unavail.	.	book	NEB TN871.3/A46/1985	U
276	.	Rules for building and classing offshore structures.	r	American Bureau of Shipping	1983	New York, N.Y.	unavail.	.	rules	NEB TC209/R8/1983	U
289	.	Recommended practice for planning, designing and constructing fixed offshore platforms.	r	American Petroleum Institute	1981	Washington, D.C.	unavail.	.	book	NEB API/RP/2A/1981	U
312	.	Recommended practice for design and operation of marine drilling riser systems.	r	American Petroleum Institute	1984 2nd ed.	Washington, D.C.	unavail.	.	book	NEB API/RP/2Q/1984	U
309	.	Code of safe practice for drilling and production in marine areas : being part 8 of model code of safe practice in the petroleum industry.	r	Applied Science Publishers	1972 2nd ed.	England	unavail.	.	book	NEB IP/MC/Pt.8/1972	U
311	.	Code of safe practice for drilling and production in marine areas : being part 8 of model code of safe practice in the petroleum industry.	r	Applied Science Publishers	1964	England	unavail.	.	book	NEB IP/MC/Pt.8/1964	U
287	.	Principles and procedures for classification of offshore installations.	r	Det Norske Veritas AS	1985	Norway	unavail.	.	book	NEB TC1665/P7	U
310	.	Summary of action taken by the Government of Canada in relation to the recommendations of the Royal Commission on the Ocean Ranger Marine Disaster.	r	Energy, Mines and Resources Canada	1985	Ottawa	unavail.	Subjects: Drilling platforms - Accidents - Safety measures Marine accidents - Newfoundland Ocean Ranger.	book	NEB TN871.3/R691/1985	U
318	.	Government of Canada response to recommendations of the Royal Commission on the Ocean Ranger Marine Disaster	r	Energy, Mines and Resources Canada	1986	Ottawa	unavail.	Summary: Government of Canada response to recommendations of the Royal Commission on the Ocean Ranger Marine Disaster.	book	NEB TN871.3/R692/1986	U
295	.	Offshore exploration : information and procedures for offshore operators	r	Energy, Mines and Resources Canada	unavail.	Ottawa	unavail.	.	book	NEB TN26/04	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
339	.	The promotion and enhancement of safety in oil and gas operations on Canadian frontier lands	r	Energy, Mines and Resources Canada	1986	Ottawa	unavail.	Summary: equipment procedures personnel / a report to the Minister of Energy, Mines and Resources ; by the Minister's Task Force on Ocean Ranger Regulatory Recommendations.	report	NEB VK1255/.022/P76	U
238	.	Draft offshore installations and wells (design and construction, etc.) regulations.	r	HSE Books	1995	London	unavail.	.	consultative document	NEB KD2368/.A35/G7	U
320	.	Code of safety practice for drilling, production, and operations in marine areas	r	Institute of Petroleum	1964	London	unavail.	Summary: Being a part of the Institute of Petroleum model code of safe practice in the petroleum industry.	book	NEB IP/MC/pt.8/1964	U
244	.	Report on the review of the dual role immersion suit systems for Canadian offshore operations.	r	Micromedia Limited	1997	Toronto, Ontario	unavail.	Subjects: Immersion suits, Life-saving apparatus	Mfiche	NEB TA 7/F43/no.2 Mfiche	U
340	.	Regulations respecting the safety of diving operations conducted in connection with the exploration or drilling for or the production, conservation, processing or transportation of oil or gas. *Short title: Canada oil and gas diving regulations.*	r	Minister of Supply and Services Canada	1989	Ottawa	79	Summary - Application: These regulations apply to any diving operation carried on in connection with the exploration or drilling for or the production, conservation, processing or transportation of oil or gas in areas which the Act applies.	gov't docs	NEB V.F. Canada. Canada Oil and Gas Diving Regulations	U
297	.	Report on the review of the dual role immersion suit systems for Canadian offshore operations.	r	NEB	1995	Calgary, Alberta	26	Study Objectives: The CORD Group was contracted by the National Energy Board of Canada to: Examine the advantages of the dual role immersion suit system approach; make recommendations on the suitability of a dual role immersion suit system for Canadian offshore oil and gas operations; and recommend an appropriate means of implementing such a system in Canada.	report	NEB TA 7/F43/no.2	U
230	.	Nova Scotia offshore certificate of fitness regulations.	r	Queen's Printer	1995	Ottawa	unavail.	Subjects: Offshore oil industry - Law and legislation - Canada Offshore oil industry - Law and legislation - Nova Scotia Natural gas Law and Legislation - Canada Natural gas - Law and legislation - Nova Scotia Petroleum - Taxation - Canada Petroleum - Taxation - Nova Scotia Marine mineral resources - Law and legislation - Canada Marine mineral resources - Law and legislation - Nova Scotia	gov't docs	NEB V.F. Canada-Nova Scotia Offshore Petroleum	U
231	.	Newfoundland offshore area registration regulations.	r	Queen's Printer	1988	Ottawa	unavail.	Subjects: Offshore oil industry - Law and legislation - Canada Offshore oil industry - Law and legislation Newfoundland Natural gas - Law and legislation - Canada Natural gas - Law and legislation - Newfoundland Petroleum - Taxation - Canada Petroleum - Taxation - Newfoundland Marine mineral resources - Law and legislation - Canada Marine mineral resources - Law and legislation - Newfoundland	gov't docs	NEB V.F. Canada. Canada-Newfoundland Atlantic Accord	U
236	.	Nova Scotia offshore area petroleum diving regulations.	r	Queen's Printer	1995	Ottawa	unavail.	Subjects: Offshore oil industry - Law and legislation - Canada - Nova Scotia Natural gas - Law and legislation - Canada - Nova Scotia Petroleum - Taxation - Canada - Nova Scotia Marine mineral resources - Law and legislation - Canada - Nova Scotia	gov't docs	NEB V.F. Canada. Canada-Nova Scotia Offshore Petroleum	U
237	.	Newfoundland offshore area oil and gas operations regulations.	r	Queen's Printer	1988	Ottawa	unavail.	.	book	NEB V.F Canada. Canada-Newfoundland Atlantic Accord	U
241	.	An Act respecting the Canada-Nova Scotia Agreement on Offshore Oil and Gas Resource Management and Revenue Sharing and to make related and consequential amendments.	r	Queen's Printer	1984	Ottawa	unavail.	.	book	NEB V.F. Canada. Canada-Nova Scotia Oil and Gas Agreement	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
245	.	Nova Scotia offshore area petroleum production and conservation regulations.	r	Queen's Printer	1995	Ottawa	unavail.	.	gov't docs	NEB V.F. Canada. Canada-Nova Scotia Offshore Petroleum	U
246	.	Newfoundland offshore drilling regulations.	r	Queen's Printer	1993	Ottawa	unavail.	.	gov't docs	NEB V.F. Canada. Canada-Newfoundland Atlantic Accord	U
253	.	Nova Scotia offshore petroleum installations regulations.	r	Queen's Printer	1995	Ottawa	unavail.	Subjects: Offshore oil industry - Law and legislation - Canada - Nova Scotia Natural gas - Law and legislation - Canada - Nova Scotia Petroleum - Taxation - Canada - Nova Scotia Marine mineral resources - Law and legislation - Canada - Nova Scotia	gov't docs	NEB V.F. Canada. Canada-Nova Scotia Offshore Petroleum	U
254	.	Newfoundland offshore certificate of fitness regulations.	r	Queen's Printer	1995	Ottawa	unavail.	Subjects: Offshore oil industry - Law and legislation - Canada - Newfoundland Natural gas - Law and legislation - Canada - Newfoundland Petroleum - Taxation - Canada - Newfoundland Marine mineral resources - Law and legislation - Canada - Newfoundland	gov't docs	NEB V.F. Canada. Canada-Newfoundland Atlantic Accord	U
264	.	Newfoundland offshore area petroleum production and conservation regulations.	r	Queen's Printer	1995	Ottawa	unavail.	Subjects: Offshore oil industry - Law and legislation - Canada - Newfoundland Natural gas - Law and legislation - Canada - Newfoundland Petroleum - Taxation - Canada - Newfoundland Marine mineral resources - Law and legislation - Canada - Newfoundland	gov't docs	NEB V.F. Canada. Canada-Newfoundland Atlantic Accord	U
266	.	Offshore pipeline regulations.	r	Queen's Printer	1984-1991	Ottawa	unavail.	.	gov't docs	NEB KE2036/.A32/C35/REF	U
273	.	Newfoundland offshore petroleum installation regulations	r	Queen's Printer	1995	Ottawa	unavail.	.	gov't docs	NEB V.F. Canada Canada-Newfoundland Atlantic Accord	U
274	.	Regulations respecting the safety of diving operations conducted in the Newfoundland offshore area in connection with the exploration of drilling for or the production, conservation, processing or transportation of petroleum.	r	Queen's Printer	1989	Ottawa	80	Application: These regulations apply to any diving operation carried on in connection with the exploration or drilling for or the production, conservation, processing or transportation of petroleum within the offshore area.	gov't docs	NEB V.F. Canada. Newfoundland Offshore Area Petroleum Diving Regulations	U
283	.	Nova Scotia offshore petroleum drilling regulations.	r	Queen's Printer	1992	Ottawa	unavail.	Subjects: Offshore oil industry - Law and legislation - Canada - Nova Scotia Natural gas - Law and legislation - Canada - Nova Scotia Petroleum - Taxation - Canada - Nova Scotia Marine mineral resources - Law and legislation - Canada - Nova Scotia	gov't docs	NEB V.F. Canada. Canada-Nova Scotia Offshore Petroleum	U
290	.	Canada Nova Scotia Offshore Petroleum Resources Accord Implementation Act and related regulations	r	Queen's Printer	1988	Ottawa	unavail.	.	gov't docs	NEB V.F. Canada-Nova Scotia Offshore Petroleum	U
341		Draft: Canada oil and gas production installations regulations.	r	Queen's Printer	1988	Ottawa	84	Summary - Application: These regulations apply: a) to any production installation on any lands to which the Act applies; and b) to every operator who constructs or places or who intends to construct or place a production installation on a production site.	gov't docs	NEB V.F. Canada. Oil and Gas Production Installation Regulations	U
746		Standards respecting standby vessels. TP 7920E	r	Ship Safety Branch, Canadian Coast Guard	1988 Oct.	Canada	unavail.	Note: October 1988 and subsequent revisions.	report	FTL	U
656		A technical assistance manual on the employment provisions of the Americans with Disabilities Act.	r	unavail.	1992	unavail.	unavail.		manual	USCG	U
492	Bourne, R.	The International Safety management Code: the importance placed upon it by Lloyd's register. In: Nautical Institute. Forth and West of Scotland Branches marine safety management - International conference and exhibition (29-30	r	The Nautical Institute	1995	London	unavail.		conference proceedings	IMO Library	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
		march 1995 : Glasgow).									
627	Bukowski, R.W.	Risk and performance standards.	r	in: Proceedings of Fire Risk and Hazard Assessment Symposium	1996	unavail.	unavail.	.	proceedings	USCG	U
626	Bukowski, R.W.	Risk and performance standards.	r	Fire Risk and Hazard Assessment Symposium.	1996	unavail.	unavail.	.	proceedings	USCG	U
493	Chauvel, A.M.	Managing safety and quality in shipping; the key to success : A guide to ISM, ISO 9002, TQM.	r	The Nautical Institute	1997	London	unavail.	.	book	IMO Library ISBN 1-870077-40-7	U
494	Corse, J.H.	Examining aspects of the ISM Code. In. IIR Ltd. Developing, implementing and auditing marine safety systems to ensure compliance with the ISM Code - Conference (10-11 March 1997 : London).	r	IIR Ltd.	1997	London	unavail.	.	conference proceedings	IMO Library	U
697	Daniel, J.	Review of new codes affecting standby ships and their possible effects.	r	SSOA, IIR Conference	1992	Aberdeen	unavail.	.	paper	DNV	U
21	Dick, Robert A. and Prior, Andrew.	Arctic survival equipment testing and analysis.	r	Transportation Development Centre	1992	Canada	variously paged	Summary: Transport Canada Publication No. TP 11403E. Report documents problems found with prototype Arctic liferaft (TP10844E) during field trials near Resolute, N.W.T. Research and testing is outlined and final condition of liferaft after modifications is presented. Also provides equipment specifications for contents of Arctic Survival Pack.	report	SPRI Shelf 629.124.791	U
258	Gault, Ian Townsend.	Guide to Canadian offshore safety regulations/ compiled by Ian Townsend Gualt; prepared for the Canadian Petroleum Association.	r	Canadian Petroleum Association	1986	Calgary, Alberta	unavail.	.	guide	NEB TC1665/G3/1986	U
486	Grinstead, J.	An overview of the latest Solas convention amendments and the urgent need for their implementation by member states. In American Bureau of Shipping (ABS) Safer ships competent crews - International Conference (24-25 October 1996 : Halifax, NS).	r	ABS	1997	New York	1-8	.	book	IMO Library	U
288	Harrison, Rowland J.	Jurisdiction over the Canadian offshore : a sea of confusion.	r	[s.l. : s.n.]	1979	Canada	unavail.	.	speeches	NEB V.F. Speeches, addresses, etc. - NEB staff - "H"	U
240	Hunt, Constance D.	The offshore petroleum regimes of Canada and Australia.	r	Canadian Institute of Resources Law	1989	Calgary, Alberta	unavail.	.	book	NEB KE1815/H85	U
487	IIR Ltd.	Developing, implementing and auditing marine safety management systems to ensure compliance with the ISM Code - Conference (10-11 March 1997 : London)	r	IIR Ltd.	1997	London	unavail.	.	conference proceedings	IMO Library	U
169	IMO	Maritime (IMO's web site)	r	IMO	unavail.	London	29	Summary: An overview of the International Convention for the Safety of Life at Sea (SOLAS), 1960, 1974 including the summaries of the	internet	Internet: www.imo.org/imo/convent/saf	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
								various amendments implemented to the document.	document	ety.htm	
14	IMO	Distributors of IMO Publications	r	IMO	2000	World Wide Web	9	Summary: This list off the internet lists distributors of IMO Publications who maintain a permanent stock of all IMO publications.	internet document	www. imo.org/imo/pubs/pubcat11.htm	U
495	International Chamber of Shipping (ICS)	International Safety Management (ISM) Code : Assessment and development of safety management systems.	r	ICS	1997	London	unavail.	.	book	IMO Library	U
1	International Maritime Organization	International Life-Saving Appliance Code (LSA Code)	r	International Maritime Organization	1997	London	55	Summary: The International Life-Saving Appliance (LSA) code was adopted by the Maritime Safety Committee (MSC) at its 66th session (June 1996) by resolution MSC.48(66), in order to provide international standards for the life-saving appliances required by chapter III of the 1974 SOLAS Convention. The Code was made mandatory under SOLAS by amendments to the Convention adopted by the MSCat the same session (res. MSC.47(66)). The amendments are expected to enter into force on 1 July 1998.	book	Bercha	U
2	International Maritime Organization	SOLAS - International Convention for the Safety of Life at Sea, 1974 - 1996 Amendments effective July 1998	r	International Maritime Organization	1998	London	64	Summary: The publication contains amendments to the International Convention for the Safety of Life at Sea (SOLAS), 1974, adopted by the Maritime Safety Committee (MSC) of IMO during 1996.	book	Bercha	U
3	International Maritime Organization	SOLAS - Consolidated Edition, 1997	r	International Maritime Organization	1997 - 2nd ed.	London	542	Summary: Consolidated text of the International Convention for the Safety of Life at Sea, 1974, and its Protocol of 1978: articles, annexes and certificates.	book	Bercha	U
11	International Maritime Organization	SOLAS - International Convention for the Safety of Life at Sea, 1974 - 1997/1998 Amendments	r	International Maritime Organization	1999	London	18	Summary: 1997/1998 Amendments to the International Convention for the Life at Sea, 1974	book	Bercha	U
12	International Maritime Organization	SOLAS - International Convention for the Safety of Life at Sea, 1974 Resolutions of the 1997 SOLAS Conference relating to bulk carrier safety	r	International Maritime Organization	1999	London	63	Summary: The remaining resolutions of the 1997 SOLAS Conference are included in this publication. Among other things, they include amendments to the Guidelines on the enhanced programme of inspections during surveys of bulk carriers and oil tankers (resolution A.744(18), as previously amended by resolution MSC.49(66), which are mandatory under regulation XI/2 of the Convention.	book	Bercha	U
466	International Maritime Organization (IMO)	Assembly resolutions and MSC Circulars superseded by the 1995 amendments to the 1978 STCW Convention.	r	IMO	1997	London	unavail.	.	book	IMO Library Doc MSC 68/5/3	U
475	International Maritime Organization (IMO)	1996 amendments to the guidelines on the enhanced programme of inspections during surveys of bulk carriers and oil tankers (Resolution A.744(18)) (Adopted in accordance with article VII of the International Convention for the Safety of Life at Seas, 1974) : Certified true copy signed on March 18th, 1997	r	IMO	1997	London	unavail.	Note: Languages: ENG, FRE, SPA.	book	IMO Library	U
476	International Maritime Organization (IMO)	1996 amendments to the International Code for the construction and equipment of ships carrying dangerous chemicals in bulk (IBC Code) (Adopted in accordance with article VII of the	r	IMO	1997	London	unavail.	Note: Languages: ENG, FRE, SPA.	book	IMO Library	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
		International Convention for the Safety of Life at Seas, 1974)									
496	International Maritime Organization (IMO)	Bibliography on the International safety Management Code (ISM Code) (As at 13/05/97).	r	IMO	1997	London	unavail.	.	bibliography	IMO Library	U
170	International Maritime Organization	SOLAS (Consolidated edition, 1997) [Effective from 1 July 1997]	r	International Maritime Organization	1997	London	unavail.	Summary: The 1997 consolidated edition incorporates the text of the Convention and all amendments in effect on 1 July 1997.: Articles of SOLAS 1974; Articles of the Protocol of 1978 relating to SOLAS 1974; Consolidated text of the annex to SOLAS 1974 and the 1978 Protocol... Resolution A. 718(17) of the IMO Assembly and resolutions of the 1994 and 1995 SOLAS Conferences. List of certificates required to be carried on board.	book	Publishing Service, International Maritime Organization (IMO)	U
171	International Maritime Organization	1996 SOLAS Amendments [Effective from 1 July 1998	r	International Maritime Organization	1998	London	unavail.	Summary: The Maritime Safety Committee of IMO adopted amendments to the SOLAS Convention in June and December 1996. These amendments entered into force on 1 July 1998. They are not incorporated into the 1997 Consolidated Edition of the SOLAS Convention. The June amendments include addition of a new part A-1 (concerning the structure of ships) to chapter II-1 and additions to the damage stability requirements for passenger ships and for cargo ships of 80 to 100 m in length in the same chapter. the amendments also include a totally revised chapter III, which, among other things makes mandatory the International Life-Saving Appliance (LSA) Code, and amendments to chapters VI (dealing with loading, unloading and stowage of bulk cargoes) is made mandatory by the changes to chapter II-2.	book	Publishing Service, International Maritime Organization (IMO)	U
172	International Maritime Organization	1997/98 SOLAS Amendments	r	International Maritime Organization	1998	London	unavail.	Summary: This publication contains amendments adopted by the MSC at its sixty-eighth (May-June 1997) and sixty-ninth (May 1998) sessions and by the 1997 Solas Conference. Resolution MSC.65(68) introduced special requirements for passenger ships carrying 400 or more passengers, as well as amendments to chapter V of the Convention concerning vessel traffic services (VTS). Resolution MSC. (69(69) introduced various amendments to chapter IV on the global maritime distress and safety system. Safety measures for bulk carriers, in the form of a new chapter XII of the Convention, as well as amendments to resolution A.744(18) to create an enhanced programme of inspection, were adopted by the 1997 SOLAS Conference.	book	Publishing Service, International Maritime Organization (IMO)	U
173	International Maritime Organization	Resolutions of the 1997 SOLAS Conference relating to bulk carrier safety.	r	International Maritime Organization	1999	London	63	Summary: This publication contains the remaining resolutions of the 1997 SOLAS Conference, i.e. resolution 2 to 9. They include amendments to Guidelines on the enhanced programme of inspections during surveys of bulk carriers and oil tankers (resolution A.744(18)), as previously amended by resolution MSC> 49(66), which are mandatory under regulation XI/2 of the Convention.	book	Publishing Service, International Maritime Organization (IMO)	U
174	International Maritime Organization	International Safety Management Code (ISM Code) and Guidelines on Implementation of the ISM Code. (1997 edition)	r	International Maritime Organization	1997	London	unavail.	Summary: With the entry into force, on 1 July 1998, of the 1994 amendments to the International Convention for the Safety of Life at Sea (SOLAS), 1974 which introduced a new chapter IX into the convention, the International Safety management Code (ISM) is made mandatory. The ISM Code evolved through the development of the Guidelines on Management for the Safe Operation of Ships and for Pollution Prevention, adopted two years later as resolution A.680(17), to its current form which was adopted in 1993 as resolution A.741(19).	book	Publishing Service, International Maritime Organization (IMO)	U
175	International Maritime	Protocol of 1988 Relating to SOLAS 1974 (1989 edition).	r	International Maritime Organization	1989	London	unavail.	Summary: Contains modifications and additions to the annex to the 1974 SOLAS Convention agreed at the International Conference on	book	Publishing Service, International Maritime	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
	Organization							the Harmonized System of Survey and Certification, 1988, and includes: Final Act of the Conference; Protocol of 1988 relating to SOLAS 1974; Resolutions adopted by the Conference.		Organization (IMO)	
176	International Maritime Organization	International Code of Safety for High-speed Craft HSC Code) (1995 edition)	r	International Maritime Organization	1995	London	unavail.	Summary: Adopted by the MSC at its sixty-third session (May 1994) by resolution MSC.36(63). The 1994 SOLAS Conference (May1994) makes the HSC Code mandatory by the addition of a new chapter X. The HSC Code had been developed following revision of the Code of Safety for Dynamically Supported Craft (resolution A.373(X)) and in recognition of the growth in size and types of high-speed craft.	book	Publishing Service, International Maritime Organization (IMO)	U
177	International Maritime Organization	International Convention for Safety of Life at Sea, 1974 (Consolidated edition, 1986)	r	International Maritime Organization	1986	London	unavail.	Note: Limited stock available.	book	Publishing Service, International Maritime Organization (IMO)	U
178	International Maritime Organization	International Conference on Safety of Life at Sea, 1960 (1970 edition).	r	International Maritime Organization	1970	London	unavail.	Note: Limited stock available.	book	Publishing Service, International Maritime Organization (IMO)	U
179	International Maritime Organization	Supplement 1 - Amendments to the 1960 SOLAS Convention adopted in 1966, 1967, 1968 and 1969 (1970 edition).	r	International Maritime Organization	1970	London	unavail.	Note: Limited stock available.	book	Publishing Service, International Maritime Organization (IMO)	U
180	International Maritime Organization	1974 edition).	r	International Maritime Organization	1974	London	unavail.	Note: Limited stock available.	book	Publishing Service, International Maritime Organization (IMO)	U
181	International Maritime Organization	1990/1991 SOLAS Amendments.	r	International Maritime Organization	1991	London	unavail.	Note: Limited stock available.	book	Publishing Service, International Maritime Organization (IMO)	U
182	International Maritime Organization	Amendments to the Protocol of 1978 relating to SOLAS 1974 concerning radio communications for the Global Maritime Distress and Safety System (1989 edition)	r	International Maritime Organization	1989	London	unavail.	Note: Limited stock available.	book	Publishing Service, International Maritime Organization (IMO)	U
183	International Maritime Organization	SOLAS (1992 edition)	r	International Maritime Organization	1992	London	unavail.	Note: Limited stock available.	book	Publishing Service, International Maritime Organization (IMO)	U
184	International Maritime Organization	1992 SOLAS Amendments	r	International Maritime Organization	1992	London	unavail.	Note: Limited stock available.	book	Publishing Service, International Maritime Organization (IMO)	U
108	International Maritime Organization	International Convention for the Safety of Life at Sea. Consolidated text of the 1974 SOLAS Convention, the 1978 SOLAS Protocol, the 1981 and 1983 SOLAS Amendments.	r	International Maritime Organization	1986	London	439	Summary: An easy reference guide to all SOLAS requirements from 1 July 1986.	book	SPK. Shelf 656.61.052	U
551	Levin (ed.)	Access regulations for licensed and operated vessels - Fire and life safety for the handicapped: Report of the Conference on Fire Safety for the Handicapped	r	unavail.	1979	unavail.	unavail.		book	USCG	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
467	Magill, C.M. / Lloyd's Register of Shipping	Future IMO legislation 1997 entering into force between January 1997 and 2010 and other significant legislation under consideration at 1 January 1997.	r	Lloyd's Register of Shipping	1997	London	unavail.	.	book	IMO Library	U
489	Manum, I. A.	The IMO's International Code of safety for ship speed marine craft satisfactory. In: Norske Sivilingenioreres Forening High speed marine craft : Safe design and safe operation - International Conference (5th : 1-13 September 1996 : Bergen	r	.	1997	Bergen	unavail.	.	conference proceedings	IMO Library	U
548	Marine Safety Directorate (Canada), Transport Canada - Safety and Security (Canada)	Marine Safety Review	r	Marine Safety Directorate of Transport	1997	Ottawa, ON	unavail.	Subject: Navigation, Canada, safety measures, periodicals, Merchant marine, ships, safety regulations	periodical	UofC VK200 .M37	U
498	Mavromatakis, E.J.	ISM Code: Is it different from an offshore safety case? In: Institute of Marine Engineering Safe and efficient ships: New approaches for design operation and maintenance - ICMES 96.	r	The Institute of Marine Engineers	1996	London	47-55	.	conference proceedings	IMO Library	U
468	Mitropoulos, E.E.	Review of latest regulations : what further needs to be done : Paper delivered at the Nautical Institute Seminar on "Safer ships - the way ahead", Liverpool, 10 October 1996.	r	unavail.	1996	Liverpool	unavail.	.	paper	IMO Library	U
490	Nautical Institute. Forth and West of Scotland Branches.	Marine safety management - International Conference and Exhibition. (London, 29-30 March 1995).	r	The Nautical Institute	1995	London	unavail.	.	conference proceedings	IMO Library	U
458	Offshore Safety Division (OSD) at HSE.	The offshore safety division (OSD).	r	HSE	1998	UK	4	Summary: This document summarizes the core purpose of the OSD which is to ensure that risks to people from work activities in the upstream petroleum and diving industries are properly controlled. OSD's duties range from direct enforcement to publishing guidance for employers and funding research.	report	OSD Information Centre, HSE	U
693	Saltoe, P.	The Norwegian approach to the new emergency preparedness regulation.	r	Norwegian Petroleum Directorate, IIR Conference	1992	Aberdeen	unavail.	.	paper	DNV	U
267	Sexsmith, Robert G.	Verification of the new CSA standards for fixed offshore production structures.	r	Canada Oil and Gas Lands Administration	1987	Ottawa	unavail.	.	book	NEB TD169/C3/no.101	U
491	Stewart, R.D.	Maritime safety and environmental regulation. In Lovett, W.A. (Ed)	r	Quorum Books	1996	London	171-189	.	book	IMO Library	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
		United States shipping policies and the world market.									
544	Transport Canada	Consolidated regulations, marine occupational safety and health.	r	Transport Canada	198-?	Canada	unavail.	.	micro fiche	UofC XX(1431849.1)	U
547	Transportation Safety Board of Canada	Marine safety reflections	r	Transportation Safety Board of Canada	1994	Hull, QB	unavail.	Subject: Navigation, Canada, Safety measures, periodicals; ships, safety regulations, Canada	periodical	UofC TN871.3 .R36 RCOR17	U
155	Tsoy, L. G.; Grechin, M.A.; Karavanov, S.B.; Glebko, Yu. V. and Mikhailichenko, V.V.	Arctic environmental law. Harmonization of polar ship rules. International and national provisions.	r	INSROP Working Paper	1999, 151	unavail.	1-55	Summary: Sub-Programme IV: Political, Legal and Strategic Factors. Examines current practice and experience of Arctic shipping, and also developments of External Working Group on Harmonization of Polar Ship Rules in relation to its work on IMO Code. Presents damage statistics as function of location on ship, and discusses power requirements for ships. Addresses proposal on common international ice classification of polar ships for insertion into international rules.	periodical	SPRI	U
773	U.S. Coast Guard	Marine Safety Manual	r	U.S. Coast Guard	unavail.	US	27	Summary: The Marine Safety Manual (MSM) is the primary policy and procedural statement for the marine safety programs of the Coast Guard. Published for the use of all Coast Guard marine safety and industry personnel, it prescribes the essential functions which must be performed to attain the overall objectives of the MI, ML, PSS, MER, and WWM programs and certain investigative functions of the RBS program. The MSM should be used as a guide for consistent and uniform administration of marine safety activities, without undue hampering of independent action and judgement by marine safety personnel.	world wide web	USCG	U
188	Umoe Schat-Harding As.	Making regulations work. Issue Three	r	Schat-Harding	1999	Norway	4	Corporate Brochure	brochure	Bercha	U
158	USSR and Norway, Kingdom of.	Agreement between the Government of the Union of Soviet Socialist Republics and the Government of the Kingdom of Norway on cooperation in the search for missing persons and rescue of disaster victims in the Barents Sea. (Russian)	r	Sobraniye Postanovleniy Pravitel'stva Soyuza Sovetskikh Sotsialisticheskoy Respublik.	1988, 4, St. 7	unavail.	56-61	Summary: Treaty. Supplement gives table of emergency frequencies, call-signs etc.	periodical	SPRI	U
698	Boath, J.	Offshore Petroleum Industry Training Organisation - Training standards for offshore emergency training.	r	Petroleum Training Validation, IIR Conference	1992	Aberdeen	unavail.	.	paper	DNV	U
465	Hindell, K.	Strengthening the ship regulating regime. In: Maritime Policy Management Vol 23/No.4.	r	Maritime Policy Management	1996	unavail.	371-380	.	periodical	IMO Library	U
760		Rescue frame: Manual recovery equipment for rescuing craft. Rescue scoop: Powered recovery system for rescue vessels. Dacon	re	Dacon	unavail	unavail	13	Summary: The Dacon Rescue Scoop is a maneuverable rescue "net" operated by a standard deck crane for the recovery of casualties from the water directly on board rescue vessels. Drawings are also provided.	information booklet and drawings	Dacon	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
756		Testing and evaluation of life saving appliances	re	International Maritime Organization (IMO)	1985	London	unavail.		report	FTL	U
750		Final test report on capsizing model tests conducted on a 1:7 scale model of an inflatable liferaft.	re	Marineering Limited report prepared for FTL	1996 June	Canada	unavail.		report	FTL	U
719		LORS - the Lifeboat Occupant Recovery System.	re	Offshore Research Focus	1987 Dec.	unavail.	unavail.	Subject: LORS.	periodical	DNV	U
753		Report on the easily recovered liferaft system trials. Report No R96-041.	re	The CORD Group Limited.	1996	unavail.	unavail.		report	FTL	U
747		Development of an easily recovered liferaft project : An intern report.	re	unavail.	1995 Sept.	unavail.	unavail.		report	FTL	U
369		Rescue analysis: method for evaluation of search and escape system for evacuation and rescue of personnel on offshore installation	re	unavail.	1990	unavail.	unavail.	Summary: Rescue analysis: method for evaluation of search and escape system for evacuation and rescue of personnel on offshore installation (includes folder: Rescue Operation Simulator (ROS) for planning and evaluation of rescue system performance offshore)	book	C-NOPB VK1463S3 1990	U
391		Use and effectiveness of standby (rescue) vessels in offshore Newfoundland: short and long-term.	re	unavail.	1983	unavail.	unavail.		book	C-NOPB VM466O35B3 1983	U
392		Survivor recovery system: system to improve the capability of rescue vessels to recover survivors from the water even if they are unconscious.	re	unavail.	1983	unavail.	unavail.		book	C-NOPB VK1447M3T4 1983	U
393		Rescue boat pick up system.	re	unavail.	1983	unavail.	unavail.		book	C-NOPB VM360T4 1983	U
394		Report and draft guidance notes on the use and effectiveness of stand-by vessels (rescue ships) in offshore operations.	re	unavail.	1981	unavail.	unavail.		book	C-NOPB VM466 O35H6 1981	U
395		Safety technology: emergency equipment and sea rescue techniques (PERD Task 6.2 Program Evaluation Workshop, Halifax, NS, June 18-19, 1986	re	unavail.	1986	unavail.	unavail.		workshop proceedings	C-NOPB VK 1463P4 1986	U
396		Capsize of the accommodation platform Alexander L. Kieland in the North Sea, 27 March 1980: Report on the search and rescue operation.	re	unavail.	1982	unavail.	unavail.		report	C-NOPB VK1255A6R4 1982	U
398		United Kingdom Maritime Search and Rescue Organization, 1979	re	unavail.	1979	unavail.	unavail.		book	C-NOPB VK1357T7 1979	U
399		Halifax Search and Rescue Region major marine disaster search and rescue contingency plan (supplement to A-oA-209-001/FP001: search and rescue orders and procedures).	re	unavail.	1984	unavail.	unavail.		book	C-NOPB VK1357N6W6 1984	U
400		Review on search and rescue in the Halifax SRR.	re	unavail.	1983	unavail.	unavail.		book	C-NOPB VK1327N6R4 1983	U
401		Position paper to identify the needs of search and rescue operations	re	unavail.	1978	unavail.	unavail.		book	C-NOPB VK1327N4S3 1978	U

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		marine perspective for Newfoundland, presented to Otto Lang, Minister of Transport, Government of Canada.									
402		Report on the evaluation of search and rescue (referred to as the Cross report)	re	unavail.	1982	unavail.	unavail.	.	report	C-NOPB VK1326N6 1984	U
404		Major air disaster plan (MAJAID): contingency plan for the rescue of the survivors of a major air disaster.	re	unavail.	1981	unavail.	unavail.	.	book	C-NOPB VK1326M3 1981	U
405	.	Report on the marine SAR program in the Victoria search and rescue region.	re	unavail.	1981	unavail.	unavail.	.	report	C-NOPB VK1326D4 1981	U
407		Performance and measurement standards for search and rescue operations (draft)	re	unavail.	1983	unavail.	unavail.	.	report	C-NOPB VK1326C28 1983	U
412		Assessment of search and rescue for east coast offshore exploration drilling operations.	re	unavail.	1984	unavail.	unavail.	.	book	C-NOPB VK1255O3R62 Rescue 1984	U
413		Oilfield standby/ rescue vessels and the east coast of Canada.	re	unavail.	1984	unavail.	unavail.	.	book	C-NOPB VK1255O3R62 Other No.4 1984	U
416		Rescue of divers: executive summary.	re	unavail.	1980	unavail.	unavail.	.	book	C-NOPB VM981A1P4 1980	U
417		Manned test of rescue-mate (the 16-man version).	re	unavail.	1982	unavail.	unavail.	.	book	C-NOPB VM987F8 1982	U
418		Evaluation of lung-powered scrubbers (II) designed for hyperbaric rescue chambers and stranded diving bells.	re	unavail.	1982	unavail.	unavail.	.	book	C-NOPB VM987F77 1982	U
419		IMO search and rescue manual.	re	unavail.	1987	unavail.	unavail.	.	book	C-NOPB VK1445I58 1987	U
420		International conference on maritime search and rescue, 1979	re	unavail.	1979	unavail.	unavail.	Summary: final act with attachments, including the international convention on maritime search and rescue, 1979.	book	C-NOPB VK1445I59 1979	U
421		Inflatable rescue boats.	re	unavail.	unavail.	unavail.	unavail.	.	book	C-NOPB SP00270	U
422		Ocean Ranger Marine disaster: The rescue attempt and the Royal Commission's recommandations	re	unavail.	1986	unavail.	unavail.	Summary: Ocean Ranger Marine disaster: The rescue attempt and the Royal Commission's recommendations (paper presented at Rescue '86, May 12-17, 1986 in Vancouver).	book	C-NOPB SP00264	U
423		Standards for rescue boats.	re	unavail.	1988	unavail.	unavail.	.	book	C-NOPB VK200C25No.TP7322E 1988	U
424		Lifesaving and rescue in the 1980's: The Fifth International Symposium 1979, sponsored by Safety at Sea (magazine)	re	unavail.	1979	unavail.	unavail.	.	magazine	C-NOPB VK1463L5 1979	U
425		Marine emergency duties (MED) (II) - Part C: search and rescue.	re	unavail.	1980	unavail.	unavail.	.	book	C-NOPB VK1447 T7M4 1980 Part C	U
428		Merchant ship search and rescue manual with Canadian modifications (CANMERSAR)	re	unavail.	1986	unavail.	unavail.	Summary: Merchant ship search and rescue manual with Canadian modifications (CANMERSAR) (includes all amendments adopted by IMO up to and including those approved at the 52nd session of the Maritime Safety Committee - Jan-Feb 1986)	manual	C-NOPB VK200C25No.Tp7085E 1986	U
429		Search and Rescue Secretariat (SARSEC) organization and funding (study initiated in response to the Cross report)	re	unavail.	1983	unavail.	unavail.	.	study	C-NOPB VK VK1326R42 1983	U

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430	.	Operation of rigid inflatables as offshore rescue craft on rig standby vessels.	re	unavail.	1981	unavail.	unavail.	.	book	C-NOPB VM360L4 1981	U
431	.	Safety technology: emergency equipment and sea rescue techniques (PERD Task 6.2 Program Evaluation Workshop, St. John's, NFLD, May 26-27, 1988	re	unavail.	1988	unavail.	unavail.	.	book	C-NOPB VK1463P4 1988	U
432	.	Results of a Canadian shipborne radar search and rescue experiment (paper).	re	unavail.	1988	unavail.	unavail.	.	paper	C-NOPB TC1645 O25 1988 P.1433	U
433	.	Results of a Canadian visual search and rescue experiment (paper).	re	unavail.	1988	unavail.	unavail.		paper	C-NOPB TC1645O25 1988 P.1433	U
434	.	Basic rescue skills.	re	unavail.	1988	unavail.	unavail.	.	book	C-NOPB RC87E42 1988	U
435	.	Training for survival and rescue at sea: conference proceedings.	re	unavail.	1986	unavail.	unavail.	.	conference proceedings	C-NOPB TN871T716 1986	U
436	.	Search and rescue orders ABD procedures.	re	unavail.	1978	unavail.	unavail.	.	book	C-NOPB VK1326N3 1978	U
437	.	Rescue boats.	re	unavail.	1990	unavail.	unavail.	.	book	C-NOPB VM360R4 1990	U
438	.	Rescue analysis: method for evaluation of search and rescue system for evacuation and rescue of personnel on offshore installation	re	unavail.	1990	unavail.	unavail.	Summary: Rescue analysis: method for evaluation of search and rescue system for evacuation and rescue of personnel on offshore installation (includes folder: Rescue Operation Simulator (ROS) for planning and evaluation of rescue system performance offshore)	book	C-NOPB VK1463 S3 1990	U
439	.	Lifesaving, search and rescue - survival.	re	unavail.	1990	unavail.	unavail.	.	book	C-NOPB VK1463B4 1990	U
440	.	Life-saving winch smoothes rescue operations.	re	unavail.	1991	unavail.	unavail.	.	book	C-NOPB VK1481 W5 1991	U
441	.	Helicopter rescue from offshore survival craft.	re	unavail.	1990	unavail.	unavail.	.	book	C-NOPB TN874U55O5 No.90-319 1990	U
444	.	National search and rescue manual.	re	unavail.	1985	unavail.	unavail.	.	manual	C-NOPB VK1327 N3C3 1985	U
23	Australia. Antarctic Division.	Survival at sea	re	Australian Antarctic Division, Shipping and Air Operations Section	1993	Hobart, TAS	6	Summary: Safety information for Australian National Antarctic Research Expedition personnel aboard RSV Aurora Australis. Includes emergency procedures; survival equipment and life rafts; and survival in water.	book	SPRI Pam 627.77	U
585	Balog, John	Transportation vehicles and superstructures	re	unavail.	1982	unavail.	unavail.		.	USCG	U
37	Breitfuss, Leonid L'vovich.	Survey of the activities of the Murman lifeboats of the Imperial Society for Rescue at Sea during 1902-1910 (Russian)	re	Russkaya Skoropechatnya	1911	St. Petersburg	148	Summary: Use made of lifeboats: plea for setting up polar stations.	book	SPRI Shelf(*686):627.95	U
411	East Coast Operators Logistic Committee - working group - (phase 1 of	Fast rescue craft: launch/recovery system project report	re	unavail.	1986	unavail.	unavail.	.	report	C-NOPB VM360C3 1986	U

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	a COGLA/PERD funded project)										
532	Emergency Rescue. Com	Lifeboat & Maritime Rescue	re	Firm Find Web Ltd.	unavail.	World Wide Web	3	Summary: This site off the internet is a directory of sites that focus on lifeboat and maritime rescue links. It is also possible to add your own link to this site.	internet	www.emergencyrescue.com	U
741	Glen, I.F., Paterson, R.B., et all.	To undertake the development of an easily recovered liferaft. Report 4446P	re	FTL with The Cord Group Limited.	1994 Dec.	Canada	unavail.	.	report	FTL	U
683	HSE	Maneuverability of TEMPSC	re	RGIT Survival Centre	1989	unavail.	unavail.	.	paper	DNV	U
44	Kichigin, M.	Help will come in time.	re	Morskoy Flot	1990, 2	unavail.	16-18	Summary: Discusses marine fire rescue facilities in White Sea.	periodical	SPRI	U
25	Laitinen, L.A.	Cold water rescue In: Rey, Louis, ed. Arctic underwater operations; medical and operational aspects of diving activities in Arctic conditions.	re	Graham and Trotman	1985	London	139-144	Summary: Considers factors affecting survival times in cold water and strategies for preventing hypothermia. Describes organization of sea rescue operations in Finland.	book	SPRIShelf(*2):626.02	U
541	Lamb, John Cameron, Sir	The Life-boat and it's work.	re	W.Clowes	1911	London	88	Subject: Royal National Life-boat Institution for the Preservation of Life from shipwreck (Great Britain). Lifeboats.	book	UofC VK1473.I.34	U
742	Majid, I., Nawwar, A.M.	The development of in-water survivor recovery strategies for the Hibernia Fields. Report FR 1509C-2	re	Arctec Canada Limited.	1994 June	Canada	unavail.	.	report	FTL	U
454	McGimpsey, Len and Timmins, Doug.	1992 Report of the Auditor General - Chapter 8 - Main Points Search and Rescue.	re	Her Majesty the Queen Right of Canada	1992	Canada	17	Summary: This is the 1992 report of the Auditor General of Canada which covers the main points of search and rescue. The report covers the following: audit scope and criteria, observations, previously proposed solutions have not been fully implemented, significant elements of a National Search and Rescue program have not been developed, service standards are lacking, opportunities exist to improve program delivery, Federal search and rescue resources do not perform the rescue in most distress incidents, expanded use of volunteer and other resources should be pursued, the provision of search and rescue service with patrol vessels requires re-examination, more use of other federal resources for search and rescue is possible, performance information is lacking, analysis of the causes of beacon failures and false alarms is required, information is needed on small boat activities and cost recovery possibilities exist.	report	Office of the Auditor General of Canada and the Commissioner of the Environment and Sustainable Development	U
336	Moir, Natalie.; Gill, Shawn D.	Capability of east coast standby vessels to deploy fast rescue craft.	re	Canada Oil and Gas Lands Administration	1988	Ottawa	unavail.	Subjects: Survival and emergency equipment Life-boats.	book	NEB TD169/C3/no.16	U
507	Moxie Media Inc	Transportation safety: A guide to offshore personnel transfers.	re	Moxie Media Inc.	unavail	New Orleans, LA	unavail.	Summary: This five part program is designed to instruct offshore oil industry workers on the safe methods of transferring from their homes to their offshore work locations. Employees will increase their awareness concerning vehicle, crewboat, swing rope, personnel basket and helicopter transfers. (30 min)	video	Moxie Media Inc OFF-TransSafety	For Sale
505	Moxie Media Inc.	"Man overboard prevention for inland waterways & maritime personnel".	re	Moxie Media Inc	unavail	New Orleans, LA	unavail.	Summary: This program explores the causes of man overboard accidents an the inland waterways and their deadly effects. Utilizing the joint recommendations of a recent AWO/ Coast Guard report, this video focuses on prevention and integrating a culture of shipboard safety. Recovery techniques, treatment of hypothermia and safe work practices are all demonstrated. (24 min)	video	Moxie Media Inc. (IW-ManOv5)	For Sale

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
518	Moxie Media Inc.	Man overboard.	re	Moxie Media Inc.	unavail.	New Orleans, LA	unavail.	Summary: Also available in Spanish. Illustrates the procedures for retrieving personnel in the water, including methods for hoisting a man into a lifeboat or stand-by boat. Details hypothermia treatment techniques and helicopter stokes liter rescue procedures. (31 min)	video	Moxie Media Inc MS-ManOverboard6	For Sale
758	Paterson, R.B., Hardiman, K.C., McKenna, R.F., Simoes-Re, A., Radloff, E.	Investigation of liferaft performance and recovery systems in extreme seas. Proceedings of the "Escape, Evacuation & Rescue Conference. 19&29 November 1996, Paper No.9.	re	Royal Institute of Naval Architects (RINA) in association with the Nautical institute.	1996	London	unavail.	.	paper	FTL	U
538	Rescue @ Sea International	Info-Search Website	re	Rescue @ Sea International	unavail.	World Wide Web	2	Summary: The Rescue @ Sea international Website is designed as a research and information gathering tool regarding Lifeboat Institutions, Societies and Associations as well as Coast Guard and other SAR agencies involved in marine rescue by sea and air.	internet	Rescue @ Sea International	U
526	Rescue Coordination Centre	Marine Resources	re	RCC	unavail.	Canada	2	Summary: This document outlines the primary marine assets including CG Ships and Cutters, which are located at stations along the coast of Nova Scotia, Prince Edward Island, New Brunswick, Quebec and Newfoundland.	internet	RCCWEB	U
527	Rescue Coordination Centre	The SAR System.	re	RCC	unavail.	Canada	2	Summary: Rescue Coordination Centre (RCC) Halifax is the focal point of all rescue within its region. It coordinates the efforts of all responding resources. Collects and distributes essential information concerning a distress situation and arranges the dispatch of rescue assets and personnel to ships or aircraft in distress.	internet	RCCWEB	U
748	Rohling, G.	Model study of fishing vessel stability in breaking waves.	re	BC Research for NRC's Institute for Marine Dynamics	1985 Dec.	unavail.	unavail.	.	report	FTL	U
204	Simoes Re, Antonio J.	Nearly dry immersion suits.	re	IMD(NRC)	1997	Canada	unavail.	Summary: In cooperation with CORD Group and the Defense and Civil Institute for Environmental Medicine "DCIEM" evaluated the performance of the new Mustang Mac200 nearly dry immersion suits for the Canadian Air Force. As part of the same study standard military life-vests were compared to new NASA type ones. The project was a continuation of research into the influence of motions and waves on the insulation properties of dry and wet suits.	study	IMD(NRC)	U
207	Simoes Re, Antonio J.	Stability of life-rafts in extreme seas.	re	IMD(NRC)	1996	Canada	unavail.	Summary: Investigate the capsize phenomenon in inflatable life-rafts and develop design or procedure changes which will improve the life-raft performance and reduce the incidence of capsizing. Investigate drag, wind, and wave loads on inflatable life-rafts with special focus on the effectiveness of different drogue designs. The work intended provided basic knowledge in the performance of life-rafts.	study	IMD(NRC)	U
214	Simoes Re, Antonio J.	"Esperanto" Survival Capsule: results of experiments in calm water and waves.	re	IMD(NRC)	1993	Canada	unavail.	Summary: Development of a test program to aid the Canadian Coast Guard with the evaluation of a new design of a five man survival capsule to be used as a supplementary life-saving equipment in small craft.	test program	IMD(NRC)	U
200	Simoes Re, Antonio J.	Sea water instrumented mannequin (SWIM)	re	IMD(NRC)	1999	Canada	unavail.	Summary: The mannequin's buoyant motions in still water and waves were evaluated so validation of the Water Forces Analysis Capability (WAFAC) mathematical model could be started. A series of exploratory experiments were conducted to check out the SWIM hardware when immersed in water to examine how well the WAFAC model simulates the motion of the actual mannequin for the same initial conditions. Both the mannequin and the software are intended to evaluate the	study	IMD(NRC)	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
								performance of personal flotation devices (PFD).			
210	Simoes Re, Antonio J.	Personnel safety systems.	re	IMD(NRC)	1994	Canada	unavail.	Summary: Implementation and development of a research program aimed at the preservation of human life in the marine environment through improved design of safety equipment and the development of more strict and efficient procedures of new and innovative designs.	research program	IMD(NRC)	U
212	Simoes Re, Antonio J.	Thermal instrumented manikin.	re	IMD(NRC)	1994	Canada	unavail.	Summary: Development of testing procedures to investigate the effects of waves on the insulation properties of survival suits with the use of a Thermal Instrumented Manikin (TIM). Analysis and presentation of the results to the Defense Civil Institute for Environmental Medicine (DCIEM) and to other government agencies such as the Canadian Coast Guard. Implementation of a program to revise the estimates of "calm water survival time" used by many authorities to guide the selection of the amount of insulation to be used in survival suits.	study	IMD(NRC)	U
216	Simoes Re, Antonio J.	Tests for Canadian Coast Guard Ship Safety Branch approval of personal locator lights.	re	IMD(NRC)	1990	Canada	unavail.	Summary: Approval testing of personal locator lights according to "Standard for Personal Locator Lights (PLL) TP9248E January 1988", Canadian Coast Guard Ship Safety Branch.	report	IMD(NRC)	U
213	Simoes Re, Antonio J.	Evaluation of GBS based, Fast Rescue Craft launch and retrieval	re	IMD(NRC)	1993	Canada	unavail.	Summary: A brief evaluation of the motions and accelerations experienced by a Fast Rescue Craft "FRC" while being launched and retrieved near the Hibernia GBS. The evaluation was based on relatively simple engineering calculations of wind and wave effects on the FRC. The objective of the study was to identify areas where the motions may become hazardous to the FRC crew.	study	IMD(NRC)	U
146	Smith, Wilbur.	Hungry as the sea.	re	Book Club Associates	1979	London	378	Summary: Fictional account of action and adventure as ex-chairman of shipping consortium rescues cruise ship stranded in Antarctic.	book	SPRI Shelf 82-3[Smith]	U
762	The Royal National Lifeboat Institution	Rescue - Around the solent - RNLI.	re	Royal National Lifeboat Institution	unavail.	UK	1	Summary: This website outlines the purpose and duties of the Royal National Lifeboat Institution.	world wide web	RNLI	U
156	United States. Department of the Army. Headquarters.	Survival.	re	Department of the Army.	1957	Washington, D.C.	285	Summary: Technique of survival on land and sea.	book	SPRI Shelf 910.2(211)	U
743	Wright, C.H.	Survival at sea: The lifeboat and liferaft.	re	Brown, Son and Ferguson Ltd.	1988	Glasgow	222-259	Subject: Survival at sea: The lifeboat and liferaft.	book	FTL	U

A.2 Worldwide EER Data and Literature Search II (Results April 1 – May 31, 2000)

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
217 a	unavail.	Foinaven FPSO Looking Shipshape (in Offshore Engineer)	?	Offshore Engineer	1995, October	unavail.	unavail.	Foinaven FPSO Looking Shipshape (in Offshore Engineer)	unavail.	unavail.	U
228 a	Civil Aviation Authority	Report of the review of helicopter offshore safety and survival	a	unavail.	1995	unavail.	unavail.	unavail.	report	unavail. (CAP 641)	U
265 a	Cullen, Lord	The Public inquiry into the Piper Alpha disaster	a	HMSO	1990	UK, London	unavail.	The Public inquiry into the Piper Alpha disaster	book	HMSO	U
266 a	Dick, D	Safety technology for offshore oil platforms (In: Green, A.E. (ed).	a	John Wiley and Sons	1982	UK, London	unavail.	Safety technology for offshore oil platforms (In: Green, A.E. (ed), High Risk Safety Technology)	book	unavail.	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
		High Risk Safety Technology)									
268 a	Geyer et al.	An evaluation of the effectiveness of the components of informative fire warning systems (In: Safety in the built environment, J.D. Sime)	a	E. & F.N. Spon	1988	UK, London	unavail.	An evaluation of the effectiveness of the components of informative fire warning systems (In: Safety in the built environment, J.D. Sime)	book	unavail.	U
26a	Gould, J.	Offshore accident rates for April 1996 to March 1998	a	Health and Safety Executive	2000, March	UK		Analysis of offshore accident rates for accidents reported under the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1995 (RIDDOR).	report	HSE RSU (OTO 2000 012)	U
29a	HSE	Offshore injury and incident statistics report 1998/1999 (provisional data)	a	Health and Safety Executive	1999, October	UK		Reported data on offshore injuries, diseases and incidents for the period 1st April 1998 to 31st March 1999.	report	HSE RSU (OTO 1999 077)	U
38a	HSE	Research on blast and fire engineering for topside structures offshore	a	Health and Safety Executive	1997	UK	4	Summarizes OSD research initiatives on blast and fire engineering for topside structures offshore.	internet document	HSE website (http://www.hse.gov.uk/osd/oilr.htm)	U
119 a	HSE	Complaints relating to safety issues on offshore installations	a	HSE	1999, June (rev.ed.)	UK	unavail.	Overview of the process by which safety concerns should be reported to management on offshore installations.	booklet - (ON 22)	HSE Books	U
120 a	HSE	Complaints relating to safety issues on offshore installations	a	HSE	1997 (rev.ed.)	UK	unavail.	This publication is superseded by the 1999 edition.	booklet - (ON 22)	HSE Books	U
123 a	HSE	Offshore Injury and Incident Statistics Report 1998/99 (provisional data)	a	HSE	1999, December	UK	unavail.	Reported data on offshore injuries, diseases, and incidents for period 1st April to 31st March 1999.	report (OTO 1999 077)	HSE RSU	U
14a	HSE - Offshore Safety Division	Offshore accident & incident statistics report 1996 [provisional data]	a	Health and Safety Executive	1996, October	UK	29	This is the fourth report in a series covering Offshore Accident and Incident Statistics. It includes data on reported fatalities, serious injuries, 3 day injuries and dangerous occurrences from 1st April 1995 to 31st March 1996.	report	HSE RSU (report no. OTO 96:955)/HSE Website	U
17a	HSE - Offshore Safety Division	Offshore accident & incident statistics report 1994	a	Health and Safety Executive	1995, May	UK	29	This report presents data on reported fatalities, serious injuries, over 3 day injuries and dangerous occurrences from 1st April 1993 to 31st March 1994.	report	HSE RSU (report no. OTO 95:953)/HSE Website	U
31a	HSE/BP Oil Grangemouth Refinery Ltd	Safety implications of self-managed teams.	a	Health and Safety Executive	1999, August	UK		A review of the literature on Self Managed Teams is presented along with four case studies of organisations which have implemented Self Managed Teams.	report	HSE RSU (OTO 99:025)	U
27a	HSE/Oxford University	Injuries on offshore oil and gas installations, an analysis of temporal and occupational factors	a	Health and Safety Executive	2000, February	UK		Information on the nature and severity of injures incurred by offshore personnel in the UK sector of the North Sea, and temporal aspects of the accident such as time of day, hours into the shift, when the accident occurred.	report	HSE RSU (OTO 1999 097)	U
18a	HSE-OSD Technology Branch, Hazard Analysis and Mitigation Unit	Offshore accident and incident statistics report 1993	a	Health and Safety Executive	1994, October	UK	70	This report is in two parts. Part 1 contains details of all reported fatalities, serious injuries, over 3 day injuries, and dangerous occurrences (Dos), for the periods 1 April 1991 - 31 march 1992 and 1 April 1992 - 31 March 1993. Part 2 contains details of hydrocarbon releases for the period 1 October 1992 - 31 march 1994. These statistics are from a database for hydrocarbon leaks, spills and ignitions set up by the HSE in response to Recommendation 39 of Lord Cullen's report "The Public Inquiry into the Piper Alpha Disaster".	report	HSE RSU (report no. OTO 94:010)/HSE Website	U
239	Naesheim.	The Alexander L. Kielland Accident	a	unavail.	1981	unavail.	unavail.	The Alexander L. Kielland Accident	report	unavail. (NOU 1981:11)	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
a	T., et al	(Royal Commission Report)									
240 a	National Transportation on Safety Board	Marine Accident Report into the Capsizing and Sinking of the U.S. Mobile Offshore Drilling Unit Ocean Ranger	a	National Transportation Safety Board	1983	USA, Washington, DC	unavail.	Marine Accident Report into the Capsizing and Sinking of the U.S. Mobile Offshore Drilling Unit Ocean Ranger	report	unavail. (Report No. NTSB-MAR-83-2)	U
241 a	Pasche, A., and R. Ilmarinen	The effect of water ingress on buoyancy and thermal quality of survival suits (in: Proceedings of Safe 22nd Annual Symposium)	a	unavail.	1984	unavail.	unavail.	The effect of water ingress on buoyancy and thermal quality of survival suits (in: Proceedings of Safe 22nd Annual Symposium)	proceedings	unavail.	U
242 a	RGIT	In-water performance assessment of lifejacket and immersion suit combinations (Report to Department of Energy)	a	unavail.	1988	Scotland, Aberdeen	unavail.	In-water performance assessment of lifejacket and immersion suit combinations (Report to Department of Energy)	report	unavail. (Department of Energy Report No. OTI 88 538)	U
243 a	Robertson, D.H.	Offshore immersion suits guidance on performance criteria	a	Department of Energy	1989	UK	unavail.	Offshore immersion suits guidance on performance criteria	report	unavail. (Department of Energy, Report No. OTH 89 292)	U
140 a	Safetycare Inc.	Building evacuation	a	Safetycare Inc.	1988	Canada	15 min	Subjects: Building evacuation, hazards, safety regulations, personnel, accident prevention, accidents, health and safety, industrial safety, occupational health	video	WAVES (CATNO: 223253)	U
244 a	Sampone, J.C. , and D.A. Reins	Physiological evalation of a commercially available abandon-ship survival suit	a	Navy Clothing and Textile Research Unit	1971	unavail.	unavail.	Physiological evaluation of a commercially available abandon-ship survival suit	report	unavail. (Technical Report No. 97)	U
91a	Santos-Reyes, J. and A.N. Beard	A systematic approach to managing fire safety on offshore installations	a	OTC (Proceedings of the 2000 Offshore Technology Conference, Houtston, Texas, May 1-4, 2000)	2000, May	Houston, Texas, USA	9	Oil and gas organisations have shifted from a prescriptive approach to a goal-setting approach to safety. However, safety and in particular fire safety still tends to be analysed in isolation, though fire loss is a result of the interactive and interrelated parts that constitute an oil and gas organisation as a whole. This paper presents a systematic approach to managing fire safety in oil and gas offshore installations. It is hoped that this systematic approach will lead not only to a more effective management of fire safety, but also to more effective management of safety, health and the environment for the oil and gas organisation as a whole.	paper (OTC 12157)	OTC	U
245 a	Steinman, A.M. et al	A comparison of protection against immersion hypothermia provided by Coast Guard anti-exposure clothing in calm versus rough seas	a	USCG	1985	USA	unavail.	A comparison of protection against immersion hypothermia provided by Coast Guard anti-exposure clothing in calm versus rough seas	report	USCG (Report No. CG-D-17-85)	U
249 a	Tipton, M.J.	Shivering and the estimation of survival time	a	HSE	1995	UK	unavail.	Shivering and the estimation of survival time	report (draft)	HSE RSU (Project No. 3228)	U
247 a	Tipton, M.J.	Laboratory-based evaluation of the protection provided against cold water by two helicopter passenger suits (in: Journal of Society of Occupational Medicine, Vol. 41)	a	unavail.	1991	unavail.	unavail.	Laboratory-based evaluation of the protection provided against cold water by two helicopter passenger suits (in: Journal of Society of Occupational Medicine, Vol. 41)	article	unavail.	U
248 a	Tipton, M.J., and F. Golden	Immersion in cold water - effects on performance and safety (in: 'Oxford Textbook of Sports Medicine', Harries, M. (ed.))	a	Oxford Medical Publications	1994	UK	unavail.	Immersion in cold water - effects on performance and safety (in: 'Oxford Textbook of Sports Medicine', Harries, M. (ed.))	article	unavail.	U
246 a	Tipton, M.J., and M.J Vincent	Protection provided against the initial response to cold water immersion by a partial coverage wet suit (in: Aviation, Space and	a	unavail.	1989	unavail.	unavail.	Protection provided against the initial response to cold water immersion by a partial coverage wet suit (in: Aviation, Space and Environmental Medicine, Vol. 60, No. 8)	article	unavail.	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
		Environmental Medicine, Vol. 60, No. 8)									
141a	Transport Canada, Airports Authority Group, Airports Safety Services	Fire prevention inspection and emergency evacuation planning manual	a	unavail.	1988	Canada	unavail.	Subjects: airports, safety measures, Fire prevention inspection and emergency evacuation planning manual	report	WAVES (CATNO: 206952, NUMBERS: TP 5292)	U
44a	UKOOA	Formal Safety Assessment (FSA)	a	UKOOA	1990	UK	.	These procedures are in two parts. Part 1 covers Objectives, Scope, Content and Submissions. Part 2 covers Corporate Safety Management, Description of Installation, Installation Safety Management, Description of Installation, Installation Safety Management, Information Relating to Potential Major Accidents, and Company Verification Plan for FSA.	unavail.	UKOOA (Code 1.20)	U
45a	UKOOA	Halon Firefighting, Equipment & Systems	a	UKOOA	1992	UK	.	These Guidelines aim to provide general engineering guidance on the issue of, and alternative options to, halon firefighting agents on existing and new UKCS offshore installations.	unavail.	UKOOA (Code 1.23)	U
304a	unavail.	A comparitive study of risk and safety perception of Norwegian and UK offshore personnel	a	NPD	1998	Norway	59	A comparative study of risk and safety perception of Norwegian and UK offshore personnel. English text.	report	NPD (Code 794, ISBN 82-7257-555-8)	U
298a	unavail.	Explosion and fire onboard the U.S. mobile offshore drilling unit Glomar Artic II in the North Sea, 130 nautical miles E-SE Aberdeen, Scotland, 01-15-85	a	unavail.	unavail.	USA	unavail.	Explosion and fire onboard the U.S. mobile offshore drilling unit Glomar Artic II in the North Sea, 130 nautical miles E-SE Aberdeen, Scotland, 01-15-85	report	NTSB (NTSB Report No. MAR-86-03; NTIS Report No. PB86-916403)	U
299a	unavail.	Capsizing and sinking of the self-elevating mobile offshore drilling unit Ocean Express near Port O'Conner, Texas, April 15, 1979	a	unavail.	unavail.	USA	unavail.	Capsizing and sinking of the self-elevating mobile offshore drilling unit Ocean Express near Port O'Conner, Texas, April 15, 1979	report	NTSB (NTSB Report No. MAR-79-05; NTIS Report No. PB-297552/AS)	U
89a	Bercha, F.G., A.C. Churcher and M. Cerovsek	Escape, Evacuation, and Rescue Modeling for Frontier Offshore Installations	eer	OTC (Proceedings of the 2000 Offshore Technology Conference, Houlston, Texas, May 1-4, 2000)	2000, May	Houston, Texas, USA	8	Assessment of the reliability of existing or proposed escape, evacuation, and rescue (EER) systems is a vital part of safety management for existing or new offshore installations. This paper will review the fundamental concepts of EER, present new methodologies for both deterministic (expected and/or worst case) and simulation modeling, and present applications of these models to frontier offshore installations. Case studies for open water jacket type production platform operations will be based on those carried out for the Sable Offshore Energy Project (SOEP) off the East Coast of Canada, and will include both deterministic and Monte Carlo simulation results. Two principal evacuation systems are used by SOEP and modeled here; namely davit launched TEMPSC and the Skyscape systems. Ways of probabilistically incorporating the interactive effects on the EER process of the initiating accident, seastate and weather, and availability of different rescue modes (standby or passing vessel, helicopter, land, or other p	paper (OTC 12158)	Bercha	U
305a	Det Norske Veritas	Evacuation and rescue means - Strengths, weakness and operational constraints	eer	NPD	1998, December	Norway	unavail.	Evacuation and rescue means - Strengths, weakness and operational constraints. Prepared for the Norwegian Petroleum Directorate and Oljeindustriens Landsforening. English text.	report	NPD (Code 795, ISBN 82-7257-581-7)	U
138a	Dugan, D., A. Trinkl, and P.S	Escape: because accidents happen: abandon ship	eer	A Nova Production by Windfall Films, Ltd., for WGBH/Boston in	1999	unavail.	60 min	How do you escape from a stranded submarine? How did the Titanic disaster ultimately save lives? What determines how a ship sinks? NOVA reveals these answers and more in a stunning look at the	video	WAVES (CATNO: 232891, ISBN: 1578071585)	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
	Aspell			association with the BBC and Suddeutscher Rundfunk				historic evolution of maritime safety. Breathtaking footage, survivor interviews and expert commentary offer a remarkable new perspective on sea safety. Meet Paul Barney and hear his courageous story of survival and rescue from a passenger ferry sinking in the Baltic Sea. See how technology will make ocean voyages safer than ever.			
8a	Electrowatt Engineering (UK) Ltd.	A trial of Hazop approach to EER assessments	eer	Health and Safety Executive	1997, July	UK	36	The objective was to test the methodology of the HAZOP technique for EER assessment as outlined in the HSE report OTH 95 466. Also the report should focus on the experience of using the proposed technique rather than on the actual EER Assessment for Elgin which (although important) is considered peripheral to this exercise. In order to use a current project for the trial it was necessary to phase the HAZOP sessions to coincide with the availability of drawings and data during detail design. The intention was to follow the published procedure as closely as possible and thereby reveal both shortcomings and positive features of the proposed system.	report	HSE RSU (report no. OTO 97:027)/HSE Website	U
4a	Gallagher, P. and KC Moran of WS Atkins Science & Technology	Evacuation, escape and rescue west of Shetlands	eer	Health and Safety Executive	1998	UK	54	This report concerns a study into the availability and operability of a range of production platform evacuation and rescue methods which are likely to be used in new field developments in the West of Shetland basin. The research involves an examination of the key factors influencing emergency response arrangements for the West of Shetlands sea area. It includes a review of the types of facility envisaged and manning levels, the type of emergency support available to each facility, the availability of helicopters and SAR services. The research also provides comparisons where appropriate with both current practice and environmental limitations in the North Sea.	report	HSE RSU (report no. OTO 98:085)/HSE Website	U
12a	Health and Safety Executive	Man overboard and personal locator beacon trials	eer	Health and Safety Executive	1997, December	UK	89	This report summarizes results of man overboard and personal locator trials. The aims of the trials were to: Determine the possibility of quick, accurate location of personnel in the water using technology and equipment that is readily available in the market place. To prove the chosen equipment by carrying out trials in Aberdeen Bay to establish the ability to locate personnel in all weather conditions where over side working and helicopter operations are permitted. To prove chosen equipment by carrying out a complete series of day and night trials in agreed sea states from the CONOCO LOGGS Platform. This system trial will include platform alarm, mother and daughter craft alarm and full MOB location. To discern by discussion and investigation the most appropriate method of fitting personal locator beacons to various work clothing, safety suits and life jackets. To discern by discussion and investigation an agreed method of coding the PLBs to allow personnel control. To test the ability to recover groups of m	report	HSE RSU (report no. OTO 96:051)/HSE Website	U
13a	Health and Safety Executive	UK PROD Trials	eer	Health and Safety Executive	1998, January	UK	174	The aim of the UK trials was to obtain further data from full scale trials offshore to consolidate the information obtained from Model Tests and the Canadian trials. The PROD system would be tested under controlled conditions in UK Offshore waters for parallel-stowed full scale (ie. 50 man - 8.0 metre) TEMPSC.	report	HSE RSU (report no. OTO 96:707)/HSE Website	U
139 a	Hollobone Hibbert and Associates Limited; Royal Commission on the	Assessment of the means for escape and survival in offshore exploration drilling operations	eer	unavail.	1984	Canada	190	Assessment of the means for escape and survival in offshore exploration drilling operations. Descriptors: Oil well drilling; submarine; safety measures, offshore structures	report	WAVES (CATNO: 161942, ISBN: BNAG9380621)	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
	Ocean Ranger Marine Disaster (Canada)										
3a	Horrell, Peter R.G. of GEC-Marconi Research Centre, Chelmsford, Essex, UK	An assessment of personnel tracking systems suitable for offshore use	eer	Health and Safety Executive	1998	UK	55	The primary aim of the study was to review personal tracking technologies in relation to their possible application offshore. In particular, methods were investigated which were capable of providing accurate head counts and tracking of personnel during an emergency, to supply information on which an Offshore Installation Manager (OIM) could base critical decisions. The study defined the important criteria to be considered when reviewing personal tracking systems. Suppliers of potential systems were located and data on their products were requested. A review of the information received resulted in an initial short list of 15 companies with potentially suitable products or technologies. This was later reduced to 6 companies. Their products were reviewed in detail. Details of the underlying technologies, both current and emerging, are presented in an appendix. The report concludes by discussing the way forward.	report	HSE RSU (report no. OTO 98:083)/HSE Website	U
282a	HSE	A methodology for hazard identification on EER assessments	eer	HSE	1995	UK	unavail.	A methodology for hazard identification on EER assessments	report	HSE RSU (OTH 95 466)	U
134a	LHR	"Standardize on Safety"	eer	LHR	2000, April 27	USA	3	LHR Services and Equipment, Inc. (LHR) home page. LHR a product supply company dedicated to safety in the offshore oilfield industry. Their online catalog covers areas including personal floatation devices, personnel transfer rescue equipment, and search and rescue, as well as offering a selection of lifejackets and survival suits.	internet document	LHR (http://www.lhrservices.com)	U
143a	Nautical Institute	Evacuation and rescue from high-sided vessels (Organised by the Dover Branch of the Nautical Institute, 14th May 1985, at the Evacuation and rescue from high-sided vessels conference, London, England)	eer	unavail.	1985	London, England	54	Subjects: Great Britain, conferences, ship design, search and rescue, survival at sea, passenger ships, evacuation, emergencies.	unavail.	WAVES (CATNO: 239278)	U
63a	ORF	Helideck Inspection	eer	ORF	2000, February	UK	-	HSE has part funded (50%) with Videotel Productions, London, an audio-visual training package about helideck inspection. The reason for funding this work is the timely provision of guidance to all associated with the offshore industry; it will be used by HSE/OSD to complement the training programme of its own Inspectors. The package sets out to demonstrate all those attributes of helidecks which need to be examined and appraised on a regular basis. The video is accompanied by written guidance to enlarge upon as well as reinforce the audio-visual message.	Review of video	Review: ORF, Issue 127 (http://www.orf.co.uk) / Video: Videotel Productions	U
64a	ORF	Helicopter Escape Research	eer	ORF	2000, February	UK	1	A project jointly funded by the Civil Aviation Authority (CAA) and the HSE has recently demonstrated the benefits of providing helicopters with additional floatation. When additional buoyancy is placed such that the helicopter floats on its side instead of inverting, ease of escape is greatly improved.	Review of report	ORF, Issue 127 (http://www.orf.co.uk)	U
68a	ORF	Implementation of Lord Cullen's R&D Recommendations	eer	ORF	1996, August	UK	-	Subject: implementation of Lord Cullen's R&D recommendations, fire and blast	Review of report	ORF, Issue 113 (www.orf.co.uk)	U
15a	Robertson, D.H., and M.E.	Review of probable survival times for immersion in the North Sea	eer	Health and Safety Executive	1996, January	UK	49	There is a need to define a realistic estimate of probable survival times for people immersed in the North Sea. The requirement underlying this work is to provide reliable data on which to base judgements on the	report	HSE RSU (report no. OTO 95:038)/HSE Website	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
	Simpson							time available to effect a successful rescue and recovery of people immersed in the waters of the UKCS. Estimates are required of times for which there is a good prospect of survival for persons entering the water, before individuals begin to succumb to the various threats to life posed by the prevailing conditions. Maximum survival times for which at least one person out of a group may survive are more relevant to decision making with regard to continuation or cessation of search and rescue activities. Such maximum likely survival times are not within the remit of this paper.			
9a	Robertson, D.H., and M.J. Wright	Ocean Odyssey emergency evacuation: Analysis of survivor experiences	eer	Health and Safety Executive	1997, April	UK	44	This report presents information on the evacuation of the Ocean Odyssey semi-submersible drilling rig following a blowout in September 1988. The study was undertaken following a recommendation that the Ocean Odyssey incident should be analyzed to indicate those areas for improvement which would offer better prospects of survival during a future emergency evacuation. The Ocean Odyssey incident is still the only occasion when TEMPSC have been used during an emergency evacuation of a North Sea installation. It thus represents a unique body of experience. The information presented here is based upon interviews with survivors undertaken by Robert Gordon's Institute of Technology Survival Centre approximately one year after the incident. HSE's objective in publishing this document is to disseminate the experience of the evacuation, as recalled by those survivors who were interviewed, and not to identify the causal chain of events associated with the incident. The report draws conclusions in three primary areas. Th	report	HSE RSU (report no. OTO 96:009)/HSE Website	U
10a	Technica Consulting Scientists and Engineers	The recovery and pick-up phase of evacuation from offshore installations - Data review and position paper for the Department of Energy	eer	Health and Safety Executive	1988, March	UK	33	The recovery and pick-up phase of an evacuation from an offshore installation consists of the transfer of survivors from the TEMPSCs, inflatable liferafts or the water to helicopters, stand-by vessels, or passing ships. The variety of possible recovery techniques and proposed alternative systems for offshore evacuation are described in this report. at present it is impossible to draw firm conclusions on their relative advantages and disadvantages, beyond the subjective opinions of experts in this field. A simplified model of the recovery phase is outlined, which would allow such a comparison to be carried out, as well as the overall risks associated with this part of the evacuation estimation.	report	HSE RSU (report no. OTO 96:010)/HSE Website	U
221 a	Allan, J.R.	Survival after helicopter ditching: A technical guide for policy makers (in International Journal of Aviation Safety, Volume 1)	ev	unavail.	1983	unavail.	unavail.	Survival after helicopter ditching: A technical guide for policy makers	article	unavail.	U
263 a	Ballingall, B.	Current developments in Evacuation and Escape (In: The latest developments in safe escape, evacuation and rescue from offshore installations, Aberdeen, February 11-12, 1992)	ev	unavail.	1992	Aberdeen	unavail.	Current developments in Evacuation and Escape (In: The latest developments in safe escape, evacuation and rescue from offshore installations, Aberdeen, February 11-12, 1992)	unavail.	unavail.	U
284 a	Barbey, A. (Schlumberger)	International Emergency Medical Evacuations and Management, Organisation and Results within a Major Oilfield Service Company	ev	unavail.	un	unavail.	unavail.	International Emergency Medical Evacuations and Management, Organisation and Results within a Major Oilfield Service Company	unavail.	NPD Library (Code: 61359)	U
7a	BMT Fluid Mechanics Limited	Davit launched TEMPSC performance project	ev	Health and Safety Executive	1997, April 22	UK	23	It has been established that there is a lack of performance data and design validation for free-fall and conventional davit-launched Totally Enclosed Motor Propelled Survival Craft TEMPSC. The open literature	report	HSE RSU (report no. OTO 97:016)/HSE Website	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
								contains relatively little detailed technical information, and little documentation of existing software and design methods. The launch of TEMPSC from an offshore installation is a complex sequence of events, involving the condition of the installation itself, the environment, personnel boarding procedures, launch and lowering, impact and entry into the water, release of the craft, and escape from the platform. Extremely complex technical issues are associated with the craft's entry into the water and manoeuvre away from the platform. There is a need for definitive and systematic model tests and/or full-scale trials to validate theoretical and numerical models, especially models representing TEMPSC entry into the water and its escape from the platform in severe weather conditions. These are needed both t			
202a	Canada Oil and Gas Lands Administration, Environmental Protection Branch	PROD - Preferred Orientation and Displacement Evacuation System	ev	Canada Oil and Gas Lands Administration, Environmental Protection Branch	unavail.	Canada	unavail.	PROD - Preferred Orientation and Displacement Evacuation System	unavail.	unavail.	U
210a	Cold Ocean Design Associates	Seascape emergency evacuation system test tower structural design	ev	unavail.	1993, May 21	unavail.	unavail.	Seascape emergency evacuation system test tower structural design	report (final)	Cold Ocean Design Associates	U
23a	Coleshaw, S.R.K., and F. Mills	Life raft inflation study	ev	Health and Safety Executive	2000, March	UK	.	A study to investigate the ability of life rafts to inflate on demand.	report	HSE RSU-f (OTO 1999 040)	U
184a	Dick, R., and M. Kalisiak	The design, construction and testing of an Arctic suvival sled	ev	Melville Shipping	1988	Canada	unavail.	Subjects: Arctic regions; John A. MacDonald (ships), search and rescue operations	report	WAVES (CATNO: 200772, NUMBERS: TP 9466 E)	U
231a	Girton, T.R., et al	An evaluation of the rough water performance characteristics of personal flotation devices	ev	US Coastguard	1984	USA	unavail.	An evaluation of the rough water performance characteristics of personal flotation devices	report	USCG (M 84 1)	U
5a	Health and Safety Executive	Design, construction, commissioning and testing of the SEASCAPE Systems Ltd. Emergency evacuation system	ev	Health and Safety Executive	1997	UK	29	This report covers the activities carried out during the design, construction, commissioning, testing and demonstration of the prototype Seascape TEMPSC launching system. These activities include the design and construction of the arm, tower and TEMPSC lifting yoke, the design and construction of the winch and the development of the initial commissioning and testing procedures. This report does not cover work previously carried out by Seascape in St. Johns, Newfoundland involving scale model testing which is addressed in earlier reports. The prototype system's successful trails showed that the SEASCAPE concept has important safety and operational advantages, including possible savings in maintenance levels, when compared to other alternative TEMPSC launching systems. It is concluded that the system has proved that it offers offshore operators a safer and more reliable option to conventional davit launched systems and that it fulfills the recommendations of the Cullen report as regards to improving the perform	report	HSE RSU (report no. OTO 97:009)/HSE Website	U
185a	Holburn, J., and T. Thompson	Abandon ship and on-ice survival tests in Arctic winter conditions	ev	Transport Canada	1987	Canada	unavail.	Subjects: equipment and supplies, search and rescue operations, transportation	report	WAVES (CATNO: 207074, NUMBERS: TP 8386 E)	U
52a	HSE	Emergency way guidance light system (Report No. OTH 97 533)	ev	HSE	1997	UK	.	Subject: Emergency ways guidance lighting system	report	HSE Books (ISBN 0-7176-1611-8)	U
204	HSE	Review of tools and data for the	ev	HSE	1995	UK	unavail.	Review of tools and data for the assessment of launch of free-fall and	report	HSE Books (Report OTN 95	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
a		assessment of launch of free-fall and conventional TEMPSC						conventional TEMPSC		135)	
220a	Muller, L. and H.G. Payer	Loads and strengths of free fall lifeboats (in Proceedings of the International Conference on Escape, Survival, and Rescue at Sea, Trans RINA 1986, Vol. 1)	ev	unavail.	1986	unavail.	unavail.	Loads and strengths of free fall lifeboats (in Proceedings of the International Conference on Escape, Survival, and Rescue at Sea, 1986)	proceedings	unavail.	U
211a	National Research Council Canada, Institute for Marine Dynamics	Seascape deployment systems full scale experiments	ev	unavail.	1994, September	unavail.	unavail.	Seascape deployment systems full scale experiments	Report (test)	National Research Council of Canada, Institute for Marine Dynamics	U
126a	Nelson, J.K., D.J. Fallon, and T.J. Hirsch	Mathematical modeling of free-fall lifeboat launch behavior (in Proceedings of the Offshore Mechanics and Arctic Engineering Conference in Stavanger, Norway)	ev	Proceedings of the Offshore Mechanics and Arctic Engineering Conference	1991, June	Stavanger, Norway	unavail.	Mathematical modeling of free-fall lifeboat launch behavior	paper	The Citadel	U
124a	Nelson, J.K., D.J. Fallon, and T.J. Hirsch	Effects of CG location on the launch behavior of free-fall lifeboats (submitted for review, ASME Journal of Offshore Mechanics and Arctic Engineering)	ev	unavail.	1992, June	USA	unavail.	Effects of CG location on the launch behavior of free-fall lifeboats	paper	The Citadel	U
125a	Nelson, J.K., D.J. Fallon, T.J. Hirsch, and J. Verhof	Effects of mass distribution on free-fall lifeboat behaviour (in Proceedings of the Offshore Mechanics and Arctic Engineering Conference in Stavanger, Norway)	ev	Proceedings of the Offshore Mechanics and Arctic Engineering Conference	1991, June	Stavanger, Norway	unavail.	Effects of mass distribution on free-fall lifeboat behaviour	paper	The Citadel	U
127a	Nelson, J.K., T.J. Hirsch, and D.J. Fallon	Feasibility of air-launched free-fall boats for use in offshore rescue (in Proceedings of the 1990 SAFE Symposium in San Antonio, Texas, December, 1990)	ev	Proceedings of the 1990 SAFE Symposium	1990, December	San Antonio, Texas, USA	unavail.	Feasibility of air-launched free-fall boats for use in offshore rescue	paper	The Citadel	U
117a	NSWCCD	Project Gallery	ev	NSWCCD	2000, April 12	USA	unavail.	The site's "Project Gallery" outlines background, advantages, specifications, characteristics and equipment for various crafts including a 9.4 M Totally Enclosed Lifeboat (TEL), a 50-person inflatable liferaft, a 25-person inflatable life raft, and a 40-fo[illegible]foot Plane Personnel Rescue Boat (PPRB).	internet document	NSWCCD web site (http://www.boats.dt.navy.mil)	U
65a	ORF	Liferaft Inflation Study	ev	ORF	1999, November	UK	1	Inflatable liferafts provide a means of escape from offshore installations 'in which personnel can float on reaching the sea' (HSE, PFEER Regulations, 1995, p 32). Some concerns have been expressed that the probability of inflation of liferafts is less than 100%. The view is based on experience from equipment demonstrations and anecdotal evidence. This study was therefore commissioned to investigate the ability of operational liferafts to inflate on demand, and review liferaft history, legislation and use.	Review of report	ORF, Issue 126 (www.Ofr.co.uk)	U
71a	ORF	Offshore Lifeboat Launch	ev	ORF	1996, February	UK		Subject: offshore lifeboat launch	Review of report	ORF, Issue 111 (www.orf.co.uk)	U
72a	ORF	Stairways and chutes evaluated	ev	ORF	1996, February	UK		Subject: stairways, chutes	Review of report	ORF, Issue 111 (www.orf.co.uk)	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
191a	Robin, G.	Survival at Sea	ev	Merchant Navy Training Board, Great Britain	1979	UK	30 min	This video documents what you should do in a lifeboat, once your vessel has capsized, in order to improve your chances of survival. It also gives details about hypothermia. Subjects: survival at sea; lifeboats; search and rescue; hypothermia; lifejackets	video	WAVES (CATNO: 224422)	U
206a	Seascape Systems	Structural design premise, Seascape System, Deployment arm and test tower	ev	unavail.	1993, January 29	unavail.	unavail.	Structural design premise, Seascape System, Deployment arm and test tower	report	Seascape (Document No. RE/SSL/APA/0001 Rev.R2)	U
207a	Seascape Systems	Deployment arm design calculations, Seascape Systems	ev	unavail.	1993, January 29	unavail.	unavail.	Deployment arm design calculations, Seascape Systems	report	Seascape (Document No. RE/SSL/APA/0002)	U
208a	Seascape Systems	Winch Specification, Seascape Systems	ev	unavail.	1993, January 21	unavail.	unavail.	Winch Specification, Seascape Systems	report	Seascape (Document No. RE/SSL/APA/0008, Rev. R1)	U
209a	Seascape Systems	Winch loading analysis report, Seascape System	ev	unavail.	1993, May 10	unavail.	unavail.	Winch loading analysis report, Seascape System	report	Seascape (Document No. RE/SSL/APA/0009, Rev. R1)	U
199a	Selantic	About Selantic	ev	Selantic	1999	Norway	unavail.	Selantic is a manufacturer of life saving appliances, special lifting equipment, hydrostatic core samplers, and special fire-fighting equipment. The product range comprises of offshore evacuation systems, passenger ship evacuation systems (MES), liferafts, rescue/MOB boats, davits, lifejackets, descenders, fibreglass cabinets, and a many more related products. The first offshore evacuation system was delivered in 1988 to Statoil. Today Selantic has delivered well over 200 vertical evacuation systems to the offshore and passenger ship segments. In addition, it has become a market leader in development of large capacity liferafts, special lifting equipment, and deep sea mooring.	internet document	Selantic (http://www.selantic.com)	U
105a	Shih, N.-J.; C.-Y. Lin; and C.-H. Yang	A virtual-reality-based feasibility study of evacuation time compared to the traditional calculation method (in Fire Safety Journal)	ev	ES	2000, June (Vol. 34, Issue 4)	unavail.	14	A virtual-reality-based feasibility study of evacuation time compared to the traditional calculation method	article	ES	U
278a	Technica	ESCAPE II - Risk assessment of emergency evacuation of offshore installations	ev	HMSO	1988	UK, London	unavail.	ESCAPE II - Risk assessment of emergency evacuation of offshore installations	book	HMSO	U
203a	Technica	The Performance of attendant vessels in emergencies offshore (Report to the UK Department of Energy)	ev	unavail.	1986, July	UK	unavail.	The Performance of attendant vessels in emergencies offshore (Report to the Department of Energy)	report	Technica (Report C737)	U
205a	Technica (on belhalf of the UK Department of Energy)	Risk Assessment of emergency evacuation from offshore installations	ev	HSE	1983, September	UK	unavail.	Risk Assessment of emergency evacuation from offshore installations	report	HSE Books (Report OTO 83 050)	U
16a	Technica Consulting Scientists and Engineers	Casualty rates in abandoning ships at sea	ev	Health and Safety Executive	1996, March	UK	52	The basis of this report is a survey of vessel incidents involving abandonment at sea. This study forms part of a larger study on the risks of evacuation from offshore structures. The main objectives of this study have been to: (1) Identify sources of information relating to casualty rates incurred in abandoning ships at sea. The survey has confined itself to the compilation of information related to incidents involving use of the ships lifesaving and escape equipments and, in particular, lifeboats and liferafts. (2) To assess this information and the derived casualty statistics with the aim of identifying particular trends in relating to success or failures of evacuation in different circumstances. (3) To express the results in a form that can be compared to the risks of evacuation from offshore structures.	report	HSE RSU (report no. OTO 95:951A)/HSE Website	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
94a	Transport Canada	Study of offshore rig evacuation systems	ev	Transport Canada	2000, May 31	Canada	2	Summary of current study (report pending) of offshore rig evacuation systems. The study objective is to identify ways to improve systems for offshore rig evacuations. The ultimate aim is to develop design standards and regulations for such systems. Funding by: Transport Canada, Marine Safety; Canadian Association of Petroleum Producers; Natural Resources Canada; Institute for Marine Dynamics.	Summary of study (Project No. 9449)	Transport Canada web site (http://www.tc.gc.ca/TDC/projects/marine/9449.htm)	U
95a	Transport Canada	Performance-based ergonomic criteria and evaluation standards for offshore rig evacuation systems	ev	Transport Canada	2000, May 31	Canada	2	Summary of report. The objective of the report was to develop performance-based ergonomic criteria for the evaluation of evacuation systems used on offshore rigs. An evacuation system extends from the moment of decision to evacuate to the moment personnel board the rescue vessel.	Summary of report (Project No.: 9635; Report: TP 13454E, Turpin Consultants, 1999)	Transport Canada web site (http://www.tc.gc.ca/TDC/projects/hfactors/9635.htm)	U
96a	Transport Canada	Extension of service interval for life rafts	ev	Transport Canada	1999, October 29	Canada	2	Summary of study (report pending). The objective of this project is to evaluate the feasibility of extending the current one-year inspection interval for life rafts without compromising safety.	Summary of study (Project No. 9269)	Transport Canada web site (http://www.tc.gc.ca/TDC/projects/marine/9269.htm)	U
142a	Transport Canada. Marine Group, Canadian Coast Guard Northern, Melville Shipping	Ship evacuation trials in ice covered waters	ev	unavail.	1987	Canada	28	Subjects: ice navigation, search and rescue operations, Ship evacuation trials in ice covered waters	report	WAVES (CATNO: 207079, NUMBERS: TP 8825 E)	U
200a	USCG	Preliminary Tests of Inflatable Liferafts for Stability in High Winds	ev	USCG	1977, December	USA	unavail	Preliminary Tests of Inflatable Liferafts for Stability in High Winds	report	USCG (CG-M-1-78)	U
107a	Ying, J.; and R.G. Bea	Siting and evacuation strategies for mobile drilling units in hurricanes (in Marine Structures)	ev	ES in association with the International Ship and Offshore Structures Congress)	1998, January 2 (Vol. 11, Issue 1-2)	unavail	27	Siting and evacuation strategies for mobile drilling units in hurricanes	article	ES	U
113a	SOS	Survival Offshore Systems	ev / p	SOS	unavail	Australia	unavail	Survival Offshore Systems (SOS) supplies and installs lifeboat / rescue boat davit systems together with ancillary equipment to Solas '98 requirements. A large part of their business is maritime training to the petroleum and marine industry. SOS markets and services survival	internet document	SOS (http://www.netspace.net.au/~whitaker/SOS.html)	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
								equipment and trains clients in its use.			
222 a	Allan. J.R., et al	The effect of leakage on the insulation provided by immersion protection clothing (in Aviation, Space, and Environmental Medicine, Vol 56, No. 11)	h	unavail.	1984	unavail.	unavail.	The effect of leakage on the insulation provided by immersion protection clothing	article	unavail. (RAF IAM Report No. 511)	U
223 a	Allan, J.R., et al	The effect of leakage on the insulation provided by immersion protection clothing (in Aviation, Space, and Environmental Medicine, Vol 56, No. 11)	h	unavail.	1985	unavail.	unavail.	The effect of leakage on the insulation provided by immersion protection clothing	article	unavail.	U
224 a	Beckman, E.L.	Thermal protection during immersion in cold water (in proceedings of the Second Symposium of Underwater Physiology)	h	US Government Printing Office	1963	USA, Washington, DC	unavail.	Thermal protection during immersion in cold water (in proceedings of the Second Symposium of Underwater Physiology)	proceedings	unavail. (NAS-NRC Publication 1181)	U
90a	Beesley, Nick	Cultural and Behavioural praactises to improve safety and quality performance	h	OTC (Proceedings of the 2000 Offshore Technology Conference, Houtston, Texas, May 1-4, 2000)	2000, May	Houston, Texas, USA	10	Since 1997 the Shearwater fabrication project has clearly demonstrated that health and safety performance has dramatically improved. This followed the introduction of a series of management led initiatives and workforce held beliefs to enhance a poor safety record. A number of factors such as the organizational environment, management attitude and individual commitment together with the catalytic effect that a prestigious project such as the Shearwater project has all influenced the issue of improving safety performance. such success has always been measured using a variety of different analytical and statistical tools. However for the Shearwater team, the greatest single factor has been shown to be associated with the personal attitudes of the management and the workforce towards health, safety and environmental matters, an unquantifiable index. These values were far more difficult to measure but were initially collected from all personnel employed on the yard through the completion of a safety climate surve	paper (OTC 12163)	OTC	U
225 a	Bullard, R.W., and G.M. Rapp	Problems of body heat loss in water immersion (in Aerospace Medicine)	h	unavail.	1970, November	unavail.	unavail.	Problems of body heat loss in water immersion (in Aerospace Medicine)	article	unavail.	U
226 a	Burton, C.A.	Man in a cold environment	h	Edward Arnold	1955	London	unavail.	unavail.	book	unavail.	U
227 a	Carlson, L.D.	Immersion in cold water and total body insulation (in Journal of Aviation Medicine)	h	unavail.	1958	unavail.	unavail.	unavail.	article	unavail.	U
88a	Coleshaw, S.R.K.	Medication for the treatment of motion sickness during evacuation / OTH 94 462	h	HSE	1997	UK	25	unavail.	report	HSE Books (ISBN 0 7176 1111 6)	U
229 a	Cotter, J.D., and N.A. Taylor	Physiological assessment of the RNZAF constant wear immersion suit: Laboratory and field trials (in Aviation, Space and Environmental Medicine, Vol. 66, No. 6)	h	unavail	1995	unavail.	unavail.	Physiological assessment of the RNZAF constant wear immersion suit: Laboratory and field trials (in Aviation, Space and Environmental Medicine, Vol. 66, No. 6)	article	unavail. (Vol 66, No 6)	U
267 a	Fennel, D.	Investigation into the Kings Cross Underground Fire	h	HMSO	1988	UK, London	unavail.	Investigation into the Kings Cross Underground Fire	book	HMSO	U
230 a	Flook, V.	A critical evaluation of mathematical models used to	h	unavail.	1991	Trondheim	unavail.	A critical evaluation of mathematical models used to predict body temperatures in a cold environment (in: Reinertson, R.E., et al (eds.),	proceeding	unavail.	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
		predict body temperatures in a cold environment (in: Reinertson, R.E., et al (eds.), Working and Survival in the Cold, Proceedings from the 1st International Cold Symposium, SINTEF UNIMED, Trondheim)						Working and Survival in the Cold, Proceedings from the 1st International Cold Symposium, SINTEF UNIMED, Trondheim)	s		
108 a	Graat, E.; C. Midden; and P. Bockholts	Complex evacuation; effects of motivation level and slope of stairs on emergency egress time in a sports stadium (in Safety Science)	h	ES	1999, March (Vol. 31, Issue 2)	unavail.	14	Complex evacuation; effects of motivation level and slope of stairs on emergency egress time in a sports stadium	article	ES	U
109 a	Harrald, J.R. et al.	Using system simulation to model the impact of human error in a maritime system (in Safety Science)	h	ES	1998, October (vol. 30, issue 1-2)	unavail.	12	Using system simulation to model the impact of human error in a maritime system	article	ES	U
235 a	Herman, R.	Do we survive with survival suits? (in: Journal of Royal Naval Medicine Service, Vol. 74)	h	unavail.	1988	unavail.	unavail.	Do we survive with survival suits? (in: Journal of Royal Naval Medicine Service, Vol. 74)	article	unavail.	U
269 a	Horiuchi, S.	An experimental study on exit choice behaviour of occupants in an evacuation under building fire (In: Proceedings of the Second International Seminar on Human Behaviour in Fire Emergencies; NBS Report)	h	National Bureau of Standards	1980	USA, Washington, DC	unavail.	An experimental study on exit choice behaviour of occupants in an evacuation under building fire (In: Proceedings of the Second International Seminar on Human Behaviour in Fire Emergencies; NBS Report)	unavail.	unavail. (NBS Report NBSIR80-2070)	U
36a	HSE	OSD/Industry occupational health research committee	h	Health and Safety Executive	1997, January 6	UK	3	A joint OSD/Industry Occupational Health Research Committee was set up at the end of 1997. This Committee was formed to promote and support research on Occupational Health of significance to the offshore sector. It will be influential in obtaining support - whether financial or other (such as access to installations and information) - for research projects. The terms of reference of the committee, the scope of the topic area covered and other matters, such as the modus operandi of the Committee and its membership are described in this internet article.	internet document	HSE website (http://www.hse.gov.uk/osd/osdochth.htm)	U
28a	HSE/Institute of Naval Standards	Human factors review of vessel motion standards	h	Health and Safety Executive	1999, December	UK		Investigation of ship motion on human performance in relation to FPSO use.	report	HSE RSU (OTO 1999 036)	U
24a	HSE/MATSU	Breaking down the barriers to safety.	h	Health and Safety Executive	2000, March	UK		Conference report on the theme of 'links between human factors and safety'.	report	HSE RSU-f (OTO 1999 090)	U
34a	HSE/University of Birmingham	Implementation of Core-Data	h	Health and Safety Executive	1999	UK		Risk assessments which consider the safety of hazardous installations must address the contribution of human error to risk. This is done by consideration of the human factors issued through a human reliability assessment. A key element of this assessment is the calculation of Human Error Probabilities (HEPS). There has been a significant lack of confidence in HEP values used in such analyses. In recent years the University of Birmingham have collected about 1,000 human error probabilities with sufficient detail to form a useful basis for a human error database potentially usable by regulators and industries. Currently this database is paper based and needs to be computerised to make it usable. A prototype computerised form of CORE-DATA has demonstrated that such an approach is feasible and desirable.	report	HSE (Project No. R67 022)	U
187 a	International Maritime Organization	A pocket guide to cold water survival	h	International Maritime Organization	1982	London	20	Subjects: survival at sea, survival, search and rescue, hypothermia, cold resistance, drowning, immersion effects	booklet	WAVES (CATNO. 233480, ISBN: 9280111159)	U
237	Katinge,	Survival in the cold	h	Blackwell Scientific	1969	unavail	unavail	Survival in the cold	book	unavail. (SBN 632 052 80 5)	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
a	W.R.			Publication							
19a	Kennedy, Brian	A human factors analysis of evacuation, escape and rescue from offshore installations	h	Health and Safety Executive	1993, March	UK	129	Previous offshore incidents, notably Piper Alpha, have shown the importance of individual human actions in determining not only the individual's chances of survival, but also those of the evacuating group. Hence, there is a need to identify and anticipate human failures/errors during the Evacuation, Escape and Rescue (EER) process, in order that steps may be taken to prevent such failures, or to ensure that their occurrence represents an acceptable risk. Currently, there is a lack of a systematic analysis of potential human failures which may readily be applied in the evaluation of offshore EER systems.	report	HSE RSU (report no. OTO 93:004)/HSE Website	U
270 a	Khisty, C.J.	Pedestrian Cross Flow Characteristics and Performance (In: Environment and Behaviour, Vol. 17, pp 679-695)	h	unavail.	1985	unavail.	16	Pedestrian Cross Flow Characteristics and Performance (In: Environment and Behaviour, Vol. 17, pp 679-695)	article	unavail.	U
238 a	Light, I.M., et al	Immersion suit insulation: The effect of dampening on survival estimates (in: Aviation, Space and Environmental Medicine, Vol. 58, No. 10)	h	unavail.	1987	unavail.	unavail.	Immersion suit insulation: The effect of dampening on survival estimates (in: Aviation, Space and Environmental Medicine, Vol. 58, No. 10)	article	unavail.	U
11a	Mearns, Kathryn, Torbjorn Rundmo, Rhona Flin, Mark Fleming, and Rachael Gordon	A comparative study of risk perception and safety in UK and Norwegian offshore personnel	h	Health and Safety Executive	1997, October	UK	54	This report presents the results of a comparative study on perceived risk and safety in UK and Norwegian offshore personnel. The main aim of the study was to identify whether there were any differences between UK and Norwegian personnel in their: (1) Perceptions of risk (major and occupational hazards and work tasks), social support, job situation, physical working conditions and management and employee commitment and involvement in safety; (2) Satisfaction with safety; (3) Attitudes to safety; (4) Self-reported accidents and near-misses; with regard to the installations they were currently working on.	report	HSE RSU (report no. OTO 96:049/HSE Website	U
65a	ORF	Motion sickness impedes evacuation	h	ORF	1997, June	UK	2	A study for HSE by RGIT Ltd., assesses the range of anti-emetic medications and their suitability for treatment of personnel during EER from offshore installations. A high incidence of seasickness has been recorded amongst survivors of accidents occurring offshore whether in lifeboats or in water. The problem is particularly extreme for the occupants of totally enclosed motor-propelled survival craft (TEMPSC). Although numerous studies have evaluated the risks involved in evacuation, escape and rescue (EER) from offshore installations, little is understood of the human stresses experienced. Canadian studies have found that seasickness may be a contributory factor in death after ditching in cold water, and have highlighted the need for more effective treatment of motion sickness.	Review of report	ORF, Issue 118 (www.orf.co.uk)	U
69a	ORF	Physical selection	h	ORF	1996, April	UK		Subject: physical selection, human factors, EER	Review of report	ORF, Issue 112 (www.orf.co.uk)	U
73a	ORF	Safety culture maturity model	h	ORF	2000, May	UK	1	This article describes a joint HSE and oil industry funded project that developed a Safety Culture Maturity Model (SCMM), which aims to improve safety in the offshore oil and gas industry. The SCMM is based on the capability maturity model concept, initially developed by the Software Engineering Institute (SEI), as a mechanism to improve the way software is built and maintained. The maturity model concept is new and therefore it was unclear if it could be effectively applied to safety culture improvement. The SCMM aims to assist organizations in (a) establishing their current level of safety culture maturity, and (b) identifying the actions required to improve their safety culture. It is	Review of report	ORF, Issue 128 (www.orf.co.uk)	U

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								proposed that companies of offshore installations in the early stages of developing their safety culture will require different improvement techniques from those with strong safety cultures.			
74a	ORF	Progress report on the Aberdeen University human factors benchmarking study	h	ORF	1999, August	UK	3	The Aberdeen University Industrial Psychology Group have recently completed the first year of data collection and analysis in their Offshore Safety Benchmarking Study. The project is being co-sponsored by OSD, HSE and 13 oil and gas companies. Nine companies volunteered one offshore installation for the benchmarking exercise and two companies provided two installations. The contractor companies involved in the study had personnel working on the target installations provided by the operating companies. The objective of this innovative study is to develop a set of key performance indicators which help determine an installation's 'state of safety' from a human factors viewpoint.	Review of report	ORF, Issue 125 (www.orf.co.uk)	U
75a	ORF	A framework for health & safety - Mapping exercise	h	ORF	1999, August	UK	3	The purpose of the mapping exercise is to bring together and collate information on current initiative that are aiming to improve health and safety in the offshore oil and gas industry. The work is being carried out by MaTSU on behalf of the Health and Safety Commission's Oil Industry Advisory Committee (OIAC): it will enable OIAC to evaluate current activity, and assess the scope for greater coordination. The pilot mapping exercise, which has just been completed, has tested the feasibility of: (a) collecting information on current health and safety initiatives direct from companies and industry associations; and (b) categorising the information into a format that is relevant to a range of end users, that is suitable for database storage and analysis, and can be readily updated in the future.	Review of report	ORF, Issue 125 (www.orf.co.uk)	U
76a	ORF	Base information for team based working articles	h	ORF	1999, August	UK	2	Some significant milestones can be claimed for the Magnus platform, operated by BP Amoco in waters northeast of Shetland. Not only is it the most northern installation in UK waters but it is also the deepest location at which a structure has been fixed to the seabed in that sector of the North Sea. Now, another notable first has been notched up by the Magnus field as the first platform to adopt new working practices designed to improve safety and efficiency as well as increase job satisfaction among offshore personnel. BP Amoco replaced the widely-used command-and-control style of platform management with a system of team-based working which empowers individuals to take greater responsibility for the smooth running of the operations. It is the first North Sea operating group to adopt the scheme launched at Offshore Europe 97 in Aberdeen to encourage companies in the offshore supply chain to make their operations more cost-effective by unlocking the hidden potential of their workforces to plan and carry out ta	Review of report	ORF, Issue 125 (www.orf.co.uk)	U
77a	ORF	Self-managed teams offshore	h	ORF	1999, March	UK	2	Offshore operators are continually striving to improve business performance and adapt their organisations to remain competitive. Increasing emphasis is being placed on teamwork, as teams can often achieve results beyond the reach of individuals. Self-managing teams are now being implemented in offshore and onshore safety critical industries. Widely adopted in manufacturing, self-managing teams involve day to day control, responsibility and decision-making being devolved to front-line employees, whilst supervisors are removed or become working team members or coaches. Such empowered teams have an established track record of improving productivity, reducing costs and raising employee involvement and satisfaction. However,	Review of report	ORF, Issue 124 (www.orf.co.uk)	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
								their impact on safety is less well understood.			
78a	ORF	Supervisor's management of safety	h	ORF	1999, March	UK	1	An increasing recognition in high reliability industries, of the importance of the cultural and behavioural aspects of safety management has arisen in recent years. While many safety climate studies (e.g. Means Flin, Fleming and Gordon, 1997) have concluded that organizational factors, such as perceived management commitment to safety are important, few to date have demonstrated effective intervention strategies aimed at team level.	Review of report	ORF, Issue 124 (www.orf.co.uk)	U
79a	ORF	Safe communication at shift handover	h	ORF	1998, October	UK	2	Investigations of several serious accidents and incidents offshore have identified failures of communication at shift handover as amongst the causal or contributory factors. This finding has been replicated in onshore industries. OSD sponsored a human factors review of the relevant literature, conducted by the Keil Centre, a Scottish firm of Chartered Psychologists.	Review of report	ORF, Issue 123 (www.orf.co.uk)	U
80a	ORF	Factoring the human factor into safety: translating research into practice	h	ORF	1998, October	UK	2	This two-year research project, running from January 1998 to December 1999, aims to develop and apply practical programmes for assessing and improving the human factors aspects of safety in the offshore oil and gas industry. The project is being run by the Aberdeen University, Industrial Psychology Group and is being co-sponsored by OSD, HSE and 19 oil and gas companies. In order to achieve the overall project objective, three work packages are being implemented which build on human and organizational factors in offshore safety: (1) safety bench-marking study, (2) crew resource management, and (3) human factors accident analysis.	Review of report	ORF, Issue 123 (www.orf.co.uk)	U
81a	ORF	OSD Shiftwork Research	h	ORF	1998, January	UK	.	The cornerstone of OSD shiftwork research has been a series of projects at the Department of Psychology, Oxford University. This work arose as a result of concerns regarding the unusual nature of the offshore shift pattern, the diversity of patterns and persistent concerns within the research community that long term shiftwork was associated with ill health.	Review of report	ORF, Issue 120 (www.orf.co.uk)	U
82a	ORF	Risk perception and safety in the offshore oil and gas industry	h	ORF	1997, June	UK	.	A report prepared by the Robert Gordon University presents the results from Project P3125 which investigated risk perception in employees working on offshore oil and gas production platforms on the UK Continental Shelf. The project was developed from work carried out in the Norwegian sector in 1989 by Dr. Rundmo at the University of Trondheim and has provided the basis for an ongoing project investigating human factors in safety offshore.	Review of report	ORF, Issue 118 (www.orf.co.uk)	U
85a	ORF	Human Factors	h	ORF	1996, October	UK	.	unavail.	Review of report	ORF, Issue 114 (www.orf.co.uk)	U
86a	ORF	Human and organisational factors in offshore safety	h	ORF	1996, August	UK	.	unavail.	Review of report	ORF, Issue 113 (www.orf.co.uk)	U
87a	ORF	The human factor in offshore safety	h	ORF	1996, February	UK		unavail.	Review of report	ORF, Issue 111 (www.orf.co.uk)	U
181a	Ostry, D., and D. Donderi	Ergonomic analysis of the rescue coordination centres and marine rescue sub-centres	h	Human Factors North Inc.	1989	Canada	106	Subjects: ergonomics, rescue services, search and rescue operations	report	WAVES (CATNO: 207053)	U
6a	Parkes, Katharine R., and Melanie J.	Psychosocial aspects of work and health in the North Sea oil and gas industry	h	Health and Safety Executive	1997	UK	72	In recent years, offshore work/leave patterns have become a topic of increasing importance in the North Sea oil and gas industry as companies have focused on the dual aims of enhancing safety and reducing costs. In this context, it has been suggested that both	report	HSE RSU (report no. OTO 97:012)/HSE Website	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
	Clark, of Dept. of Experimental Psychology, University of Oxford							purposes could be served if a 3-3 work/leave pattern (i.e. three weeks offshore alternating with three weeks shore leave) were operated on offshore installations in place of the more usual 2-2 pattern (i.e. two weeks offshore alternating with two weeks shore leave). Although many of those concerned are dismayed at the possibility of having to work three consecutive weeks offshore, there is little direct evidence about the effects of longer work/leave cycles on the performance, health and psychological well-being of offshore personnel and their families. The research consisted of several separate studies sharing a common aim of enhancing understanding of psychosocial factors, and their implications for the health and well-being of personnel in the contex			
110a	Rundmo, T., H. Hestad, and P. Ulleberg	Organisational factors, safety attitudes and workload among offshore oil personnel (in Safety Science)	h	ES	1998, July (vol. 29, Issue 2)	unavail.	12	Organisational factors, safety attitudes and workload among offshore oil personnel	article	ES	U
271a	Sime, J.D.	The concept of panic in fires (Paper presented in the panel on Panic Session at the conference on Behaviour in Fires, October/November, 1978)	h	National Bureau of Standards	1978	USA, Washington, DC	unavail.	The concept of panic in fires (Paper presented in the panel on Panic Session at the conference on Behaviour in Fires, October/November, 1978)	proceedings	unavail.	U
272a	Sime, J.D.	Movement toward the familiar: person and place affiliation in a fire entrapment setting (In: Environment and Behaviour, 17(6), pp697-724)	h	unavail.	1985	unavail.	27	Movement toward the familiar: person and place affiliation in a fire entrapment setting (In: Environment and Behaviour, 17(6), pp697-724)	article	unavail.	U
274a	Sime, J.D.	Measuring people's movements in a fire (Presented at the Third International Seminar on Human Behaviour in Fires, September 2-4, University of Edinburgh)	h	unavail.	1990	UK	unavail.	Measuring people's movements in a fire (Presented at the Third International Seminar on Human Behaviour in Fires, September 2-4, University of Edinburgh)	proceedings	unavail.	U
273a	Sime, J.D., and M. Kimura	The timing of escape: Exit choice behaviour in fires and building evacuations (In: Safet in the Build Environment, J.D. Sime)	h	E. & F.N. Spon	1988	UK, London	unavail.	The timing of escape: Exit choice behaviour in fires and building evacuations (In: Safety in the Build Environment, J.D. Sime)	article	unavail.	U
275a	Stahl, F.I., and J. Archea	Final Report on the B Fires/Version 1 Computer Simulation of Emergency Egress behaviour during fires: Calibration and analysis (NBS Report)	h	National Bureau of Standards	1979	USA, Washington, DC	unavail.	Final Report on the B Fires/Version 1 Computer Simulation of Emergency Egress behaviour during fires: Calibration and analysis (NBS Report)	report	unavail. (NBS Report NBSIR79-1713)	U
276a	Stahl, F.I., and J. Archea	An assessment of the technical literature on emergency egress behaviour: Calibration and Analysis (NBS Report)	h	National Bureau of Standards	1977	USA, Washington, DC	unavail.	An assessment of the technical literature on emergency egress behaviour: Calibration and Analysis (NBS Report)	report	unavail. (NBS Report NBSIR79-1713)	U
277a	Sugiman, T., and J. Misumi	Development of a new evacuation method for emergencies: Control of collective behaviour by emergent small groups (In: Journal of Applied Psychology, 73, 1, pp3-10)	h	unavail.	1988	unavail.	7	Development of a new evacuation method for emergencies: Control of collective behaviour by emergent small groups (In: Journal of Applied Psychology, 73, 1, pp3-10)	article	unavail.	U
102a	Transport Canada	Motion and human factors in search and rescue	h	Transport Canada	1998, August 31	Canada	2	Summary of study. The objective of this project was to determine the effects of ship motion on crew performance, particularly in target detection.,	Summary of study (Proj	Transport Canada web site (http://www.tc.gc.ca/TDC/projects/marine/8545.htm)	U

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									ect No. 8545; Reports: TP 12230E, Fleet Technology Ltd., 1994, and TP 12442E, Fleet Technology Ltd., 1995.)		
281a	Wallace, I.	Human factors and emergency evacuations (In: The practicalities and realities of human factors in offshore safety, Aberdeen, Sept. 30 - Oct 1, 1992)	h	unavail.	1992	UK, Aberdeen	unavail.	Human factors and emergency evacuations (In: The practicalities and realities of human factors in offshore safety, Aberdeen, Sept. 30 - Oct 1, 1992)	proceedings	unavail.	U
35a	HSE	Offshore Research and Development Programme 1997 Project Handbook	misc	Health and Safety Executive	1997	UK	.	The Offshore Safety Division of the Health and Safety Executive has responsibility for research and development on offshore safety. The R&D programme is undertaken to support HSE's regulatory responsibility for the safety of the offshore workforce and installations, and therefore has a broad technical scope ranging from 'Collisions' to 'Wells and Well Operations'. The aim of the handbook is to provide information annually on R&D projects which are currently in progress or have recently been completed. to assist in the search for information, projects are grouped, in numerical order and into sections according to the programme area (e.g., Evacuation, Escape and Rescue; Human Factors). The number of projects in each area are also shown.	document	HSE Books	U
37a	HSE	Strategy for offshore research - 1996/97 : summaries and objectives	misc	Health and Safety Executive	1996	UK	.	Over recent years the strategy for offshore health and safety research has been developed with input from all Branches in the Offshore Safety Division. This has included a review of the major offshore hazards, consideration of estimates of the fatality rates for each hazard, investigating the ways in which the probability of the associated risks can be reduced, assessing their potential consequences and how these can be mitigated. Account has also been taken on potential for evaluating and identifying means of reducing the risks and consequences by research. The research strategy is continually under review in the light of developments both within the programme and the offshore industry. The Offshore Safety Division Research programme is structured in terms of 20 strategy areas. Individual strategies and key	book	HSE Books	U

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								research objectives have been developed for each of these areas. Included in the 20 strategy areas are: Evacuation, Escape and Rescue; Fire and Blast; Human Factors; and Safety Systems.			
20a	HSE/MATSU	A framework for health and safety: mapping exercise - Extension 2 to Phase 1	misc	Health and Safety Executive	2000, March	UK		A report covering further work done to extend the initial pilot mapping study "A framework for health and safety: mapping exercise - phase 1", carried out by MATSU, to identify the health and safety initiatives already undertaken in the offshore industry under a number of key issues.	report	HSE RSU-f (OTO 1999 091)	U
21a	HSE/MATSU	A framework for health and safety: mapping exercise - Phase 1	misc	Health and Safety Executive	2000, March	UK		This study identifies current health and safety initiatives, categorises these initiatives, and recommends areas for further research.	report	HSE RSU-f (OTO 1999 023)	U
22a	HSE/MATSU	A framework for health and safety: information sheets for initatives idenitifed in Phase 1	misc	Health and Safety Executive	2000, March	UK		This study identifies current health and safety initiatives, categorises these initiatives, and recommends areas for further research.	report	HSE RSU-f (OTO 1999 031)	U
121 a	HSE/MATSU	A framework for health & safety - Mapping exercise - Extension 2 to Phase 2	misc	HSE	2000, March	UK	unavail.	A report covering further work done to extend the initial pilot mapping study "A framework for health and safety: mapping exercise - phase 1", carried out by MATSU, to identify the health and safety initiatives already underway in the offshore industry under a number of key issues.	report (OTO 1999 091)	HSE RSU	U
106 a	Manning, D.P., C. Jones, F.J. Rowland, and M. Roff	The surface roughness of a rubber soling material determines the coefficient of friction on water-lubricated sufaces - The ultimate challenge in research on slip resistance (in Journal of Safety Research)	misc	a joint publication of the National Safety Council and Pergamon	1998, Winter (Vol. 29, Issue 4)	unavail.	8	The surface roughness of a rubber soling material determines the coefficient of friction on water-lubricated surfaces - The ultimate challenge in research on slip resistance	article	ES	U
48a	UKOOA	Medical Aspects of Fitness for Offshore Work - A Guide for Examining Physicians	misc	UKOOA	2000	UK		These Guidelines set out what is considered to be good practice regarding the level of health and fitness required for persons working offshore They have been compiled to aid the Examining Physician's assessment of the medical fitness of an individual to work in the offshore environment.	unavail.	UKOOA (Code 1.31)	U
61a	UKOOA	Step Change Status Report - Furthering a Goal of a 50% Improvement in Safety	misc	UKOOA	1999	UK		The Step Change in Safety initiative was launched in September 1997. Two years on, this brochure assesses the progress that has been made.	report	UKOOA (Code: Free)	U
254 a	BMEC	The British Marine Equipment Council (BMEC)	misc.	BMEC	2000	UK	unavail.	The British Marine Equipment council (BMEC(is a federation of four Trade Associations - the British Marine Equipment Association, the British Oil Spill Control Association, the British Naval Equipment Association, and the Association of British Offshore Industries - plus an affiliated Ports and Terminals Group, and as such represents suppliers of equipment and services in all sectors of the industries involving naval and merchant ships (including fishing vessels), ports and terminals, offshore oil and gas, and pollution prevention and control.	internet document	BMEC (http://ww.bmec.org.uk)	U
250 a	MCA	The Maritime and Coastguard Agency	misc.	MCA	2000, June 02	UK	2	An introduction to the Maritime and Coastguard Agency, describing services provided.	internet document	MCA (http://www.mcagency.org.uk)	U
301 a	NPD	The Norwegian Petroleum Directorate	misc.	NPD	1999	Norway	unavail.	The Norwegian Petroleum Directorate's web site. The objective and duties of NPD are to contribute to creating the highest possible values for society from oil and gas activities founded on a sound management of resources, safety, and the environment. Includes a section entitled "The regulation of safety and working environment on the continental shelf".	internet document	NPD (www.npd.no)	U
306 a	OED	Ministry of Petroleum and Energy	misc.	OED	unavail	Norway	unavail.	Home page of the Norwegian Royal Ministry of Petroleum and Energy Includes press releases, speeches and publications (Norwegian	internet	ODIN (http://www.oed.dep.no)	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
								Petroleum Activity 1999).	document		
264 a	Bullen, C.	Evacuation and rescue in the North Sea: A statistical perspective (In: The latest developments in safe escape, evacuation and rescue from offshore installations, Aberdeen, February 11-12, 1992.	n	unavail.	1992	Aberdeen	unavail.	Evacuation and rescue in the North Sea: A statistical perspective (In: The latest developments in safe escape, evacuation and rescue from offshore installations, Aberdeen, February 11-12, 1992.	unavail.	unavail.	U
112 a	Flin, R., K. Mearns, R. Gordon, and M. Fleming	Risk perception by offshore workers on UK oil and gas platforms (in Safety Science)	n	ES	1996, February 4 (vol. 22, issue 1-3)	unavail.	9	Risk perception by offshore workers on UK oil and gas platforms	article	ES	U
232 a	Golden, F.	Hypothermia: A problem for North Sea industries (in: Journal of Society of Occupational Medicine)	n	unavail.	1979, October	unavail.	unavail.	Hypothermia: A problem for North Sea industries (in: Journal of Society of Occupational Medicine)	article	unavail.	U
236 a	Higgenbottam, C.	Estimation of Survival Time of Offshore Workers in the North Sea (Report for Elf Enterprise Caledonia Ltd.)	n	unavail.	undated	unavail.	unavail.	Estimation of Survival Time of Offshore Workers in the North Sea (Report for Elf Enterprise Caledonia Ltd.)	report	unavail.	U
122 a	HSE/Durham University	Review of offshore programmable electronic systems	n	HSE	2000, March	UK	unavail.	The final summary document of the ROPES (Review of Offshore Programmable Electrical Systems) project to study programmable logic control, energy shut down and fire and gas codes on a North Sea oil production platform.	unavail.	HSE RSU	U
307 a	NOF	Northern Offshore Federation	n	NOF	unavail.	UK	unavail.	Homepage of the Northern Offshore Federation (NOF). The North of England is now established as one of the foremost regions in Europe supplying the Offshore Industry. NOF is dedicated to representing the national and international business interests of our member companies and promoting the North of England as an area of expertise in the offshore oil, gas and associated energy related industries.	internet document	NOF (http://www.nof/co.uk/nofhome.htm)	U
115 a	Osprey Inflatables Ltd.	Osprey Rigid Inflatable Boats	n	Osprey Inflatables Ltd.	2000	UK	unavail.	Osprey boats are approved by the Department of Transport for Police commercial diving operations. The boats are used throughout the world in many different and exacting locations. From the hostile environments of the North Sea to the jungles of South East Asia. The deepV hull design copes admirably, making light work of the heaviest sea conditions.	internet document	Osprey Inflatables web site (http:www.ospreyinflatables.co.uk)	U
218 a	Robertson, D.H., and M.E. Simpson	Review of probable survival times for immersion in the North Sea	n	unavail.	1995	UK	unavail.	Review of probable survival times for immersion in the North Sea	report	HSE RSU (OTO-95-038)	U
111 a	Rundmo, T.	Changes in risk perception among North Sea offshore personnel in the period 1990 to 1994 (in Safety Science)	n	ES	1996, may (vol. 21, Issue 3)	unavail.	16	Changes in risk perception among North Sea offshore personnel in the period 1990 to 1994	article	ES	U
308 a	SEEG	Scottish Enterprise Energy Group	n	SEEG	unavail.	Aberdeen	unavail.	Homepage of the Scottish Enterprise Energy Group (SEEG). The aim of SEEG is to strengthen the oil and gas, renewable energy and power generation cluster in Scotland, through improved competitiveness and diversification of companies into the oil and gas industry. It acts as both catalyst and delivery mechanism in the support and development of the energy industries in Scotland. The site also provides information on Scottish companies providing safety equipment and systems, and safety training.	internet document	SEEG (http://www.se-energy.co.uk)	U
219 a	Standing, R.G.	Green seas damage on FPSOs and FSUs (report to HSE-OSD)	n	unavail.	1996	UK	unavail.	Green seas damage on FPSOs and FSUs	report	HSE RSU (Project No. 44068/00)	U

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60a	UKOOA	OCES - Operators Cooperative Emergency Services Leaflet	n	UKOOA	1997	UK	.	The international oil and gas industry in the North Sea and adjacent waters has established a cooperation of mutual assistance in the case of an emergency. The Operators Cooperative Emergency Services (OCES) is the organizational framework within which the members can cooperate on emergency preparedness.	leaflet	UKOOA (Code: Free)	U
259a	American Petroleum Institute	Recommended practice for training of personnel in rescue of persons in water (1st ed.)	p	American Petroleum Institute	1990	USA	unavail.	Recommended practice for training of personnel in rescue of persons in water	book	IP (Book ID No.: 2278)	U
260a	American Petroleum Institute	Training of personnel in rescue of persons in water (2nd ed.)	p	American Petroleum Institute	1995, October	USA	unavail.	Training of personnel in rescue of persons in water	book	IP (Book ID No.: 7872)	U
183a	Dick, R., J. Holburn, and E. Thompson	Arctic survival equipment tests: 1987/88	p	Transport Canada	1988	Canada	unavail.	Subjects: equipment and supplies, search and rescue operations, transportation	report	WAVES (CATNO: 207082, NUMBERS: TP 9158 E)	U
93a	ECGI	ECGI Luminex Marine and Offshore Evacuation Symbols	p	ECGI	1999	USA	4	Photoluminescent marine and offshore evacuation symbols.	internet document	ECGI (www.ecgi.net)	U
137a	IASST	International Association for Safety and Survival Training	p	IASST	1999, December 14	unavail.	unavail.	The International Association for Safety and Survival Training (IASST) was founded in 1980 by a group of major safety training providers whose aim was to enhance the quality of emergency response training by encouraging an interchange of knowledge and experience between training providers on a global basis. The broad spectrum of maritime knowledge represented through IASST offers unrivalled expertise in many areas, including: lifesaving appliances and other safety equipment, training techniques, sea survival, search and rescue, emergency communications, fast rescue craft handling, and offshore emergency control.	internet document	IASST (www.iasst.com)	U
172a	International Association for Sea Survival Training	Third International Conference Training for Survival and Rescue at Sea (Proceedings: Marine Institute, St. John's, Newfoundland, October 2nd - 5th, 1991)	p	unavail.	1991	St. John's, NFL, Canada	unavail.	Subjects: conferences, training, health and safety, survival at sea, search and rescue	proceedings	WAVES (CATNO: 235492)	U
283a	Lexow, K. (Norwegian Air Ambulance)	Challenges in Emergency Preparedness. Time for Changing Focus?	p	unavail.	unavail.	unavail.	unavail.	challenges in emergency preparedness	unavail.	NPD Library (Code: 61360)	U
302a	NPD	Safety and working environment in the offshore petroleum industry	p	NPD	1992	Norway	8	A guide to the understanding of the safety regime by the Ministry of Local Government and the Norwegian Petroleum Directorate. English text.	booklet	NPD (Code: 762, ISBN 82-7257-366-0)	U
83a	ORF	Stress in offshore survival course trainees	p	ORF	1997, April	UK	.	To work offshore, individuals are generally required to have offshore survival certificates obtained after undergoing training on a recognised course. There have been criticisms that undergoing these courses is extremely stressful, particularly to an aging workforce. A study to analyse the stress in offshore survival course trainees was therefore initiated to investigate the anecdotal suggestion that survival training may cause undue stress to the aging workforce.	Review of report	ORF, Issue 117 (www.orf.co.uk)	U
84a	ORF	Computer Based training (CBT) increases in popularity	p	ORF	1997, February	UK	.	The current economic climate and advances in automated technology are driving the move towards lower levels of personnel deployed offshore. From a peak in 1991 of 27,000, the offshore workforce had fallen by 2,500 in 1994 and is forecast to continue to fall into the next century. A review of IT training applications for (1) induction courses,	Review of report	ORF, Issue 116 (www.orf.co.uk)	U

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								(2) personal safety equipment, (3) Permit to Work, and (4) hazardous materials, was undertaken.			
135 a	OSSC	Offshore Oil & Gas Industry Training	p	OSSC	1999, December 21	Canada	2	A thumbnail sketch of offshore oil and gas industry training courses offered by the Offshore Safety and Survival Centre (OSSC). Certificate courses include: Basic Survival Training (BST), Basic Survival Training Recurrent (BST(R)), Offshore Fire Team (OFT), Offshore Fire Team Recurrent, MODU Rescue Craft Team, and Offshore Helicopter Firefighting and Rescue.	internet document	OSSC (http://www.ifmt.nf.ca)	U
154 a	Transport Canada	Cold weather marine survival guide	p	Transport Canada	1997	Ottawa, Canada	unavail.	Subjects: marine technology; survival at sea; survival; search and rescue; atmospheric fronts; polar zones	unavail.	WAVES (CATNO: 207110, NUMBERS: TP 11690 E)	U
279 a	UKOOA	Guidelines for Offshore Emergency Training	p	UKOOA	1991	UK	unavail.	Guidelines for Offshore Emergency Training	unavail.	UKOOA	U
280 a	UKOOA	Guidelines for Emergency Drills and Exercises on Offshore Installations	p	UKOOA	1991	UK	unavail.	Guidelines for Emergency Drills and Exercises on Offshore Installations	unavail.	UKOOA	U
129 a	VMI	An introduction to offshore safety	p	VMI	unavail.	UK	22 mins	This video provides a valuable introduction to the offshore environment and stresses the need for safety there. For, although rules and regulations may vary between different countries and different operators, the importance of safety is universal offshore. The overriding message of the film is that everyone going offshore must listen to safety briefings and instructions, make sure they understand them, and then comply with them. Subjects dealt with in detail include muster stations and lifeboat drills - learn what to do and where to go in an emergency.	video	VMI (Code No. 918)	U
2a	Advanced Mechanics & Engineering Ltd.	Assessment of the historical development of fixed offshore structure design codes	r	Health and Safety Executive	1999	UK	86	This report concerns an assessment of the historical development of the fixed offshore structure design codes used in the UK; these are the American Petroleum Institute's recommended practice RP2A, which was first published in 1969 and is now on its 20th Edition, and the D3n/HSE Guidance Notes, first introduced in 1974 and now on its 4th Edition. The growth of fixed structures in the North Sea has been assessed, and a database of structural information has been assembled. Major incidents affecting North Sea structures have also been considered.	report	HSE RSU (report no. OTO 99.015)/HSE Website	U
136 a	C-NOPB	Canada-Newfoundland Offshore Petroleum Board	r	Communications Coordination Services Branch of Public Works and Government Services Canada	2000, February 7	Canada	1	Canada-Newfoundland Offshore Petroleum Board (C-NOPB) website. The Board administers as a regulatory body all petroleum activities within the Newfoundland offshore area in accordance with the provisions of the Canada-Newfoundland Atlantic Accord Implementation Act as enacted by the Parliament of Canada and the Legislature of Newfoundland and Labrador, and other relevant legislation.	internet document	C-NOPB (http://canada.gc.ca)	U
253 a	Department of Transport	SOLAS 2 Life-saving signals: answering signals made by lifesaving stations when signals are seen from a ship or a person in distress.	r	HMSO	1994	UK	unavail	A card overviewing SOLAS 2 Life-saving signals: answering signals made by lifesaving stations when signals are seen from a ship or a person in distress.	card	MCA (ISBN 011 551214 4)	U
262 a	Det Norske Veritas	Offshore safety legislation: The integrated approach (at 1996 annual seminar held in Aberdeen, February 27, 1996)	r	unavail.	1996, February 27	Aberdeen	unavail.	Offshore safety legislation: The integrated approach (at 1996 annual seminar held in Aberdeen, February 27, 1996)	book	IP (Book ID No.: 8165)	U
261 a	E&P Forum; the Oil Industry International	Lifeboat safety guidelines	r	unavail.	1995, June	unavail.	unavail.	Lifeboat safety guidelines	book	IP (Book ID No.: 7426)	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
	Exploration and Production Forum										
234 a	Health and Safety Commission	*Prevention of Fire and Explosion, and Emergency Response on Offshore Installations*. Approved Code of Practice and Guidance.	r	HMSO	1995	UK	unavail.	*Prevention of Fire and Explosion, and Emergency Response on Offshore Installations*. Approved Code of Practice and Guidance.	unavail.	HMSO (No. L65)	U
25a	HSE	Safety notices. Revised Ed.	r	Health and Safety Executive	2000, March	UK		A list of all current Safety Notices.	safety notice	HSE Books (available on subscription)	U
32a	HSE	Safety notices. Revised Ed.	r	Health and Safety Executive	1999, September	UK		Current listing of Safety Notices	safety notice	HSE Books (available on subscription)	U
33a	HSE	Offshore helideck design and operation (Safety notice 4/99) rev. ed.	r	Health and Safety Executive	1999, September	UK		Notifies offshore industry of new safety related research in the area of helideck design.	safety notice	HSE Books (available on subscription)	U
39a	HSE	Prevention of fire and explosion, and emergency response on offshore installations - Offshore installations (Prevention of fire and explsion, and emergency response) Regulations 1995	r	Health and Safety Executive	1995	UK		Prevention of fire and explosion, and emergency response on offshore installations - Offshore installations (Prevention of fire and explosion, and emergency response) Regulations 1995	book	HSE Books	U
132 a	HSE	Safety representatives and safety committees on offshore installations	r	HSE	1999	UK	unavail.	The short leaflet is aimed at offshore workers. It sets out their main rights, and explains the obligations imposed on installations owners/operators; other employers and offshore installation managers (OIMs), under the Offshore Installations (Safety Representatives and Safety Committees) Regulations 1989 (S.I. 1989 No. 971, as amended). The main aim of the Regulations is to ensure that employers, OIMs and the workforce cooperate towards the common goal of reducing accidents and occupational ill health offshore. The leaflet follows on from the previous HSE publication of a more detailed booklet, "*A Guide to the Offshore Installations (Safety Representatives and Safety Committees) Regulations 1989*"	leaflet	HSE Books (HSE Ref.: INDG119[rev1], ISBN 0 7176 1637 1)	U
133 a	HSE	A guide to the Offshore Installations (Safety Represenatatives and Safety Committees) Regulations 1989	r	HSE	1998, May	UK	unavail.	Takes into account a number of amendments made to the Regulations since they were first introduced and more closely mirror the goal-setting approach taken with offshore safety legislation following Lord Cullen's recommendations arising from his inquiry into the 1988 Piper Alpha disaster.	leaflet	HSE Books (HSE Ref.: L110, ISBN 0 7176 15499)	U
216 a	HSE	"Prevention of fire and explosion, and emergency response on offshore installations" - Offshore installations (Prevention of Fire and Explosion, and Emergency Response) Regulations 1995	r	HSE	1995	UK	unavail.	Prevention of fire and explosion, and emergency response on offshore installations - Offshore installations (Prevention of Fire and Explosion, and Emergency Response) Regulations 1995	unavail.	HSE Books (L65)	U
180 a	International Maritime Organization	Conference of parties to the protocol of 1978 relating to the International Convention for the Safety of Life at Sea, 1974	r	International Maritime Organization	1989	London, England	18	Conference of parties to the protocol of 1978 relating to the International Convention for the Safety of Life at Sea, 1974 on the Global Maritime Distress and Safety System: final act of the Conference with resolution and amendments to the Protocol of 1978 relating to the International Convention for the Safety of Life at Sea.	booklet	WAVES (CATNO: 235715)	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
								1974 concerning Radiocommunications for the Global Maritime Distress and Safety System. Subjects: international agreements, conferences, safety regulations, governments, survival at sea, distress signals, communication systems, search and rescue, International Convention for the Safety of Life at Sea			
251 a	MCA	Survey of life-saving appliances - Volume 1: Instructions and the guidance of surveyors	r	The Stationery Office	1999	UK	unavail.	Survey of life-saving appliances - Volume 1: Instructions and the guidance of surveyors	unavail.	MCA (ISBN 0 11 552001 5)	U
252 a	MCA	Survey of life-saving appliances - Volume 2: Instructions and the guidance of surveyors - testing of life-saving appliances	r	The Stationery Office	1999	UK	unavail.	Survey of life-saving appliances - Volume 2: Instructions and the guidance of surveyors - testing of life-saving appliances	unavail.	MCA (ISBN 0 11 552002 3)	U
255 a	n/a	Offshore Safety Act 1992 (c.15)	r	HMSO	1992	UK	8	An Act to extend the application of Part I of the Health and Safety at work etc. Act 1974; to increase the penalties for certain offences under that Part; to confer powers for preserving the security of supplies of petroleum and petroleum products; and for connected purposes.	Act	HMSO (ISBN 0 10 541592 8)	U
289 a	Norwegian royal decree	Regulations relating to safety in the petroleum activities with comments	r	unavail.	1997, June 27 (Royal Decree), 1998, November (last published)	Norway	13	Regulations relating to safety in the petroleum activities with comments. Laid down by Royal Decree of 17 June 1997. English and Norwegian text. Last published November 1998.	regulations	NPD (Code: 006, ISBN 82-7257-539-6)	U
290 a	Norwegian royal decree	Regulations relating to worker protection and working environment in the petroleum activities with guidelines	r	unavail.	1992, November 27 (Royal Decree), 1999, April (last published)	Norway	28	Regulations relating to worker protection and working environment in the petroleum activities with guidelines. Laid down by Royal Decree of 27 November 1992. English and Norwegian text. Last published April 1999.	regulations	NPD (Code 007, ISBN 82-7257-468-3)	U
291 a	Norwegian royal decree	Regulations relating to safety delegates and working environment committees	r	unavail.	1977, April 29 (Royal Decree); 1996, March (last published)	Norway	89	Regulations relating to safety delegates and working environment committees. Laid down by Royal Decree of 29 April 1977. English and Norwegian text. Last published March 1996.	regulations	NPD (Code 062, ISBN 82-7257-483-7)	U
292 a	Norwegian royal decree	Regulation to Act relating to petroleum activities	r	unavail.	1997, June 27 (Royal Decree), 1999, February (last published)	Norway	25	Regulation to Act relating to petroleum activities. Laid down by Royal Decree of 27 June 1997. English and Norwegian text. Last published February 1999.	regulations	NPD (Code 005, ISBN 82-7257-582-5)	U
293 a	Norwegian royal decree	Regulatory supervisory activities with the safety etc. in the petroleum activities on the Norwegian continental shelf	r	unavail.	1985, June 28 (Royal Decree); 1987, September (last published)	Norway	10	Regulatory supervisory activities with the safety etc. in the petroleum activities on the Norwegian continental shelf. Laid down by Royal Decree of 28 June 1985. English and Norwegian text. Last published September 1987.	regulations	NPD (Code 034, ISBN 82-7257-187-0)	U
294 a	Norwegian royal decree	Regulations relating to management systems for compliance with statutory	r	unavail.	1997, June 27 (Royal Decree),	Norway	6	Regulations relating to management systems for compliance with statutory requirements in relation to safety, working environment and protection of the external environment in the petroleum activities with	regulations	NPD (Code 018, ISBN 82-7257-542-6)	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
		requirements in relation to safety, working environment and protection of the external environment in the petroleum activities with comments			1998, January (last published)			comments. Laid down by Royal Decree of 27 June 1997. English and Norwegian text. Last published January 1993.			
285 a	NPD	Regulations relating to safety and communication systems on installations in the petroleum activities with guidelines	r	NPD	1992, February 7 (issued) / 1999, June (last published)	Norway	30	Regulations relating to safety and communication systems on installations in the petroleum activities with guidelines. Issued by the Norwegian Petroleum Directorate 7 February 1992. English and Norwegian text. Last published June 1999.	regulations	NPD (Code: 056, ISBN 82-7257-601-5)	U
286 a	NPD	Guidelines to regulations relating to safety and communication systems etc.	r	NPD	1992, February 7 (Last amended 25 March 1999)	Norway	unavail.	Guidelines to regulations relating to safety and communication systems etc. Published by the Norwegian Petroleum Directorate 7 February 1992. Last amended 25 March 1999.	guidelines	NPD	U
287 a	NPD	Regulations relating to explosion and fire protection of installations in the petroleum activities with guidelins	r	NPD	1992, February 7 (issued), June 1998 (last published)	Norway	33	Regulations relating to explosion and fire protection of installations in the petroleum activities with guidelines. Issued by the Norwegian Petroleum Directorate 7 February 1992. English and Norwegian text. Last published June 1998.	regulations	NPD (Code 057, ISBN 82-7257-567-1)	U
288 a	NPD	Guidelines to regulations relating to explosion and fire protection etc.	r	NPD	1992, February 7 (published), 1998, February 25 (Last amended)	Norway	unavail.	Guidelines to regulations relating to explosion and fire protection etc. Published by the Norwegian Petroleum Directorate 7 February 1992. Last amended 25 February 1998.	guidelines	NPD	U
303 a	NPD	Safety Notices from the Norwegian Petroleum Directorate	r	NPD	1989	Norway	57	Collection of Safety Notices published in the period 1980 - 1989. English and Norwegian text.	book	NPD (Code 728, ISBN 82-7257-296-6)	U
296 a	NPD, the Directorate of Health (now the Norwegian Board of Health), and the Ministry of the Environment	Guidelines to regulations relating to emergency preparedness, etc.	r	NPD, the Directorate of Health (now the Norwegian Board of Health), and the Ministry of the Environment	1992, March; 25 March 1999 (last amended)	Norway	unavail.	Guidelines to regulations relating to emergency preparedness, etc.	guidelines	NPD	U
295 a	NPD, the Directorate of Health (now the Norwegian Board of Health), and the Ministry of the Environment	Regulations relating to emergency preparedness in the petroleum activities with guidelines	r	unavail.	1992, March 18 (issued), 1999, June (last published)	Norway	39	Regulations relating to emergency preparedness in the petroleum activities with guidelines. Issued by the Norwegian Petroleum Directorate, the Directorate of Health (now the Norwegian Board of Health), and the Ministry of the Environment 18 March 1992. English and Norwegian text. last published June 1999	regulations	NPD (Code 054, ISBN: 82-7257-562-0)	U
92a	Szwed, P.S., and R.G.	Development of a Safety Management Assessment for the	r	OTC (Proceedings of the 2000 Offshore	2000, May	Houston, Texas, USA	9	Numerous studies have identified that the vast majority of high-consequence maritime accidents are largely attributable to human and	paper (OTC	OTC	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
	Bea	International Safety Management Code		Technology Conference, Houtston, Texas, May 1-4, 2000)				organizational factors. Some would argue that human and organizational factors play a significant role in all maritime accidents. In an industry where technological equipment and hardware solutions have typically began applied to improve and promote shipboard safety, it has become increasingly important to examine and exploit human and organizational factors as an area fruitful for overall safety improvement. This paper summarizes the development and application of an International Safety Management Code based Safety Management Assessment System (ISM-SMAS) for shipboard systems. The ISM-SMAS provides a framework for the opportunity to focus on the human and organizational factors that have a major influence on the safety of marine operations.	1215 6)		
190 a	Transport Canada, CMTA, Canadian Coast Guard, Special Projects & Polic Coordination	National policy for marine search and rescue	r	Transport Canada	1975	Canada	unavail.	Subjects: water transportation	unav ail.	WAVES (CATNO: 208156)	C
40a	UKOOA	Competence and training in emergency response - The management of	r	UKOOA	1997	UK		These Guidelines replace Guidelines for Offshore Emergency Training (1993) and Guidelines for Emergency Drills and Exercises on Offshore Installations. These Guidelines set out UKOOA's recommendations on the Management and Competence and Training in Emergency Response for all persons who work on, or visit, offshore installations in the UKCS.	unav ail.	UKOOA (Code 1.06)	U
41a	UKOOA	Emergency response for offshore installations - management of	r	UKOOA	1995	UK		These Guidelines provide those with responsibilities in the offshore industry for devising and assessing emergency response arrangements with broad guidance on methods of how to go about assessing developing and justifying the adequacy of their arrangements for Emergency Response. These Guidelines address the development and assessment of arrangements for potential major accidents, including the development of appropriate performance standards. Specific guidance on what arrangements should be chosen or details of specific technical options are not included.	unav ail.	UKOOA (Code 1.11)	U
42a	UKOOA	Fibre Reinforced Plastics (FRP) for use Offshore	r	UKOOA	1994	UK		These Guidelines identify factors which should be addressed when considering the application of FRP materials on offshore installations. These Guidelines are intended to be a common checklist for design engineers, end users, and approval authorities, to ensure that all relevant factors relating to specific applications of FRP in the offshore environment have been considered. These Guidelines do not contain specific guidance on physical performance parameters or acceptance criterias of the materials.	unav ail.	UKOOA (Code 1.16)	U
43a	UKOOA	Fire and Explosion Hazard Management	r	UKOOA	1995	UK		These Guidelines have been prepared to encourage an integrated approach to the management of Fires and Explosions. As such, they complement the Safety Case and should help those persons with responsibilities for the safe design, construction, and operation of installations to manage fire and explosion hazards.	unav ail.	UKOOA (Code 1.17)	U
46a	UKOOA	Helicopter Operations - Offshore Radio Operators' Procedures	r	UKOOA	1994	UK		These Procedures, which have been jointly prepared by UKOOA and the BHAB, outline the offshore Radio Officer's normal and emergency procedures for operations with helicopters and defines alerting services	unav ail.	UKOOA (Code 1.26)	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
								and the related duties and responsibilities.			
47a	UKOOA	Helideck Operations - The Management of Offshore	r	UKOOA	1997	UK	.	These Guidelines provide advice on the management and operation of offshore helidecks on installations and vessels, and the provision of suitable arrangements to assure their availability under both normal and emergency situations. These Guidelines set down goals and objectives for the different aspects of design, construction and operation and provide examples of good industry practice to achieve acceptable performance standards.	unavail.	UKOOA (Code 1.27)	U
49a	UKOOA	Police Roles and Responsibilities for Oil and Gas Offshore Installations in Emergency Situations - Guidance on - (Issue No. 2)	r	UKOOA	1997	UK	.	This document sets out guidance for oil and gas companies operating offshore with focus on the police approach and immediate response in emergency situations. It is intended to supplement rather than to replace the individual Standing Operating Procedures of offshore operating companies. The document itself has no legal basis or inherent authority.	unavail.	UKOOA (Code 1.41)	U
50a	UKOOA	Risk Related Decision Support - Industry Guidelines on a Framework for	r	UKOOA	1999	UK	.	In these guidelines UKOOA has set out the basis for managing the risks of offshore operations for the UK Oil and Gas Industry. It represents and integrates the many different approaches to major accident hazard safety evaluations and decision making.	unavail.	UKOOA (Code 1.415)	U
51a	UKOOA	Safety Zones Around Subsea Installations - Establishment & Buoyage of - (Issue No. 2)	r	UKOOA	1997	UK	.	These Guidelines provide advice to Operators seeking to establish a Safety Zone around a subsea installation. Whenever possible, subsea installations should be designed and constructed in shuch a manner so as to deflect fishing trawls and withstand their impact, unless a 500 metre Safety Zone has been established around the installation. Some existing consents may include a requirement for buoyage and these Guidelines are not intended to conflict with any specific conditions currently in force.	unavail.	UKOOA (Code 1.43)	U
52a	UKOOA	Safety-critical Element - Management of	r	UKOOA	1996	UK	.	These Guidelines are intended to be used to help those involved in the management of major accident hazards to identify and verify the integrity of SCEs. Following these Guidelines will assist in the compliance of relevant requirements of the Safety Case Regulations, particularly those aspects modified by Design & Construction Regulations (DCR) and the Prevention of Fire and Explosion, and Emergency Response Regulations (PFEER).	unavail.	UKOOA (Code 1.44)	U
55a	UKOOA	Sudden Death Offshore or Suspicion of Crime - Offshore Installations Managers (OIMs) Concerning - (July 1995, Issue No. 3)	r	UKOOA	1995	UK	.	These joint Guidelines, which were drawn up by UKOOA in consultation with the relevant Police forces in Scotland and England with responsibility for UK offshore oil and gas installations, reflect the coming into force of the Management and Administration Regulations on 20 June 1995.	unavail.	UKOOA (Code 1.57)	U
56a	UKOOA	Support Vessels - Safe Management and Operations of Offshore	r	UKOOA	1998	UK	.	This Code provides guidance to Operators and Owners of offshore installations, OIMs and Owners/Manager, Masters and crew of offshore support vessels, in order to avoid or reduce the hazards and risk which affect offshore vessels and their crews in the normal operations.	unavail.	UKOOA (Code 1.58)	U
57a	UKOOA	Telecommunication Systems on Normally Attended Installations - Safety Related - (Issue No. 2)	r	UKOOA	1996	UK	.	These Guidelines have been prepared to give guidance on the design of telecommunications systems required for safety purposes on NAI associated with oil and gas production in UKCS waters.	unavail.	UKOOA (Code 1.59)	U
58a	UKOOA	Telecommunication Systems on Normally Unattended Installations - Safety Related - (Issue No. 2)	r	UKOOA	1996	UK	.	These Guidelines have been prepared to give guidance on the design of telecommunications systems required for safety purposes on NAI associated with oil and gas production in UKCS waters.	unavail.	UKOOA (Code 1.60)	U
59a	UKOOA	Communicating the Safety Case	r	UKOOA	1997	UK	.	These Guidelines have been compiled following consultation with both the Health and Safety Executive and the Oil and Gas workforce. They are intended to help make the Safety Case more accessible to the workforce, and more relevant to the needs of the individual.	unavail.	UKOOA (Code: Free)	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
213 a	UKOOA / IADC / BROA / SSOA	Guidelines for the operation of vessels standing by offshore installations	r	UKOOA	1997	UK	unavail.	Guidelines for the operation of vessels standing by offshore installations	unavail.	UKOOA	U
214 a	UKOOA / IADC / BROA / SSOA	Guidelines for the survey of vessels standing by offshore installations	r	UKOOA	1997	UK	unavail.	Guidelines for the survey of vessels standing by offshore installations	unavail.	UKOOA	U
128 a	VMI	Helideck Inspections Offshore	r	VMI	unavail.	UK	unavail.	Almost all offshore installations and many ships are equipped to receive regular or emergency visits from helicopters delivering people and/or supplies. Their safety, and that of the ship or installation, is very dependent on the correct design, maintenance and operation of the helideck. This programme shows some of the considerations governing siting of the helideck and some of the key aspects which should be checked regularly to ensure compliance with the regulations.	video	VMI (Code No. 655)	U
131 a	VMI	Safety in Offshore Operations	r	VMI	unavail.	UK	29 mins	This video shows how Norway's law of the sea regarding safety applies to supply boats, the hospital safety boats and the oil rigs stationed in the North Sea over the Norwegian Continental Shelf. The concepts of safety are the same for all maritime operations, but the requirements for organizing safety committees, increasing safety awareness and developing safe working practices demand attention to the special conditions and activities of each vessel, even in offshore operations.	video	VMI (Code No. 903)	U
193 a	3M	Search and rescue after sundown	re	3M	1969	USA	7 min	This video describes the importance of having reflective material on lifesaving equipment. At night, this will greatly improve your chances of being found. Subjects: search and rescue, locating, survival at sea, safety devices, life jackets, lifeboats, reflective materials, reflectors (safety devices)	video	WAVES (CATNO: 225408)	U
196 a	Blake, E.V.	Arctic experiences: containing Capt. George E. Tysons's wonderful drift on the ice-floe, a history of the Polaris Expedition, the cruise of the Tigress, and rescue of the Polaris suvivors; to which is added a general arctic chronology	re	Harper & Brothers	1974	New York, USA	486	Arctic experiences	book	WAVES (CATNO: 150640, NUMBERS: BNAE1672798)	U
257 a	British Standards Institution	Firefighting and rescue service vehicles: Part 1: Nomenclature and design	re	unavail.	1998	UK	unavail.	Firefighting and rescue service vehicles: Part 1: Nomenclature and design	book	IP (Book ID No.: 11364, BS EN: 1846-1:1998, ISBN: 0580298337)	U
177 a	Bryant, D. J. Russel, and R. Fitzgerald	Search and rescue experiment to derive leeway and drift rates for common search and rescue objects: Notre Dame Bay, Newfoundland, Summer 1989	re	NORDCO Limited	1990	Canada	unavail.	Subjects: search and rescue operations	report	WAVES (CATNO: 200810, NUMBERS TP 10221 E)	U
159 a	Canadian Coast Guard, Fleet Engineering Services, MNC Group Inc.	Launch and recovery system for CCGS Sir Humphery gilbert & CCGS Leonard J. Cowley	re	MNC Group Inc.	1997	St. John's, NFL, Canada	unavail.	Subjects: Canada; ship technology; ships; davits; search and rescue; surveys; Sir Humphrey Gilbert (ships); Leonard J. Cowley (ships)	report	WAVES (CATNO: 237141, NUMBERS: MNC ref. 2245-20	U
165 a	Canadian Coast Guard, Fleet Systems,	Aluminum ARUN type self-righting search and rescue vessel design check	re	Industries Raymond (1989) Inc.	1994	Canada	unavail.	Subjects: ships, ship technology; marine technology; design and construction; search and rescue	report	WAVES (CATNO: 200913)	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
	Industries Raymond (1989) Inc.										
148 a	Canadian Coast Guard, Rescue and Environmental Response	1996 marine search and rescue incidents - annual report	re	Canadian Coast Guard	1998	Canada	39	Subjects: Canada, coastguards, statistics, search and rescue, salvaging, environmental protection, annual reports	book	WAVES (CATNO: 223934)	U
168 a	Canadian Coast Guard, Search and Rescue	Search and rescue needs analysis 1993	re	Canadian Coast Guard	1993	Canada	unavail.	Subjects: Canada, search and rescue, coastguards	report	WAVES (CATNO: 233454, NUMBERS: TP 11986)	U
114 a	Canadian Lifeboat Institution	Welcome to the Canadian Lifeboat Institution	re	CLI	unavail.	Canada	unavail.	The Canadian Lifeboat Institution (CLI) has been in operation for over 18 years. During that time members have participated in over 3,000 rescues, working in close cooperation with other search and rescue organizations. CLI does not attempt to replace the Canadian Coast Guard or its Auxiliary - it provides vessels and trained crews to assist local, provincial and national agencies to save those in peril on the waters of Canada.	internet document	Canadian Lifeboat Institution web site (http://www.netlink2000.com/lifeboat/cli.html)	U
297 a	CCG	Global Marine Distress and Safety System (GMDSS)	re	CCG	1999, August 6	Canada	7	Provides information on the Global Maritime Distress and Safety System (GMDSS), a new international system using improved terrestrial and satellite technology and ship-board radio systems. It ensures rapid alerting of shore-based rescue and communications authorities in the event of an emergency. In addition, the system alerts vessels in the immediate vicinity and provides improved means of locating survivors.	internet document	CCG (http: www.ccg-gcc.gc.ca/ser-saie/SAR/gmdss-smdsm/main.htm)	U
195 a	Cygnet Films (for Schermuly Limited)	Aid for the asking	re	Cygnet Films (for Schermuly Limited)	1969	UK	23 mins	This video describes the various types of distress signals which may be used to help search and rescue teams locate people in danger. Subjects: search and rescue, locating, survival at sea, distress signals	video	WAVES (CATNO: 225397)	U
256 a	Daniel, J., and J. Westwood (of Douglas-Westwood Limited)	Arrangement for Offshore Recovery and Rescue (1st ed.)	re	unavail.	1997	unavail.	unavail.	Arrangement for Offshore Recovery and Rescue	book	IP (Book ID No.: 9253)	U
258 a	Department of Energy; Techword Services	Helicopter rescue form offshore survival craft	re	unavail.	1990	UK	unavail.	Helicopter rescue form offshore survival craft	book	IP (Book ID No.: 2053, ISBN: 0114033298)	U
145 a	Department of Fisheries and Oceans Canada	Canadian coast guard : research and development plan [1999-2000]	re	Fisheries and Oceans	1999	Canada	146	Subjects: Canada, coastguards, research, navigation, ice breaking, search and rescue, communication, marine technology	book	WAVES (CATNO: 236218, NUMBERS: Cat. No. T31-83/2000; DFO/5241;MPO/5241, ISBN: 0662643771)	U
147 a	Department of Fisheries and Oceans Canada	Canadian coast guard : research and development plan [1998 - 1999]	re	Fisheries and Oceans	1998	Canada	143	The Canadian Coast Guard Research and Development Plan provides a comprehensive summary of the research projects planned for fiscal year 1998.99 by the various branches and regions. Subjects: Canada, coastguards, research, navigation, ice breaking, search and rescue, communication, marine technology	book	WAVES (CATNO: 236218, NUMBERS: Cat. No. T31-83/2000; DFO/5241;MPO/5241, ISBN: 0662643771)	U
151	Dubreuil,	Come quick danger : a history of	re	Department of	1998	Canada	136	Subjects: Canada; radio; communication system; marine technology;	report	WAVES (CATNO: 227012,	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
a	Stephan	marine radio in Canada		Fisheries and Oceans, Canadian Coast Guard				navigation; historical account; search and rescue; radio aids		NUMBERS: Cat. No. T31-107/1998E, ISBN: 0660174901)	
173 a	Dunlop Marine Safety Limited	Dunlop inflatable emergency rescue boat instruction manual for type 500 SAR vessels CCGS John Jacobson and CCGS Gordon Reid	re	Dunlop Marine Safety Limited	1990	Merseyside, England, UK	unavail.	Subjects: ships, ship technology, marine technology, Gordon Reid (ships), inflatable boats, John Jacobson (ships), rescue boats, search and rescue	manual	WAVES (CATNO: 204393)	U
176 a	Finlayson, D., D. Bryant, and B. Dawe	Search and Rescue target detection experiment - Canso Bank, 1988	re	NORDCO Limited	1990	Canada	unavail.	Subjects: search and rescue operations	report	WAVES (CATNO: 200809, NUMBERS: TP 10078 E)	U
170 a	Fitzgerald, R.	Drift of common search and rescue objects: Phase II	re	Oceans Ltd.	1993	St. John's, NFL, Canada	unavail.	Subjects: life-boats, search and rescue operations	report (final)	WAVES (CATNO: 201008, NUMBERS: TP 11673 E)	U
149 a	Gallagher, J., Canadian Coast Guard	Lessons learned: Swiss Air Flight #111 recovery operation	re	Canadian Coast Guard	1998	Canada	15	Subjects: accidents, search and rescue, emergencies, disasters	booklet	WAVES (CATNO: 240817)	U
212 a	Gallagher, P., and P. Goodwin (report prepared by WS Atkins for UK HSE Offshore Safety Division)	Operating envelopes of offshore rescue methods	re	unavail.	1995	UK	unavail.	Operating envelopes of offshore rescue methods	report	HSE Books	U
233 a	Golden, F. et al	The "After Drop" and death after rescue from immersion in cold water (in: Adam, J. (ed.), Hypothermia Ahore and Afloat)	re	Aberdeen University	1981	Scotland, Aberdeen	19	The "After Drop" and death after rescue from immersion in cold water (in: Adam, J. (ed.), Hypothermia Ashore and Afloat)	article	unavail.	U
161 a	Hafen, B.Q., K.J. Karren, and J.J. Mistovich	Prehospital emergency care (5th ed.)	re	Prentice Hall	1996	New Jersey, USA	900	Subjects: medicine, health and safety, injuries, search and rescue, emergencies, emergency medicine, crisis intervention	book	WAVES (CATNO: 233129, ISBN: 189303763X)	U
175 a	Hansen, Alan (director)	EPIRB 406 MHz: Survival at Sea	re	Topek Production	1990	Canada	15 min	Subjects: emergencies, equipment, satellites; positioning systems; search and rescue; survival at sea; radiobeacons; electronic beacons; artificial satellites in navigation	video	WAVES (CATNO: 225614)	U
158 a	Hike Metal Products, Ltd., Canadian Coast Guard, Fleet Systems	Trials data: CCGS Wesport type 300A search and rescue vessel ARUN class	re	Hike Metal Products	1997	Ontario, Canada	unavail.	Subjects: Tests and trials records - CCGS Wesport class ARUN lifeboat; ships, ship technology; marine technology; testings; tests, ship performance; Wesport (ships)	report	WAVES (CATNO: 200417)	U
162 a	Hike Metal Products, Ltd., Canadian Coast Guard, Fleet Systems	Trials data: CCGS Clark's Harbour type 300A search and rescue vessel ARUN	re	Hike Metal Products	1996	Ontario, Canada	unavail.	Subjects: Tests and trials records: CCGS Clark's Harbour type ARUN lifeboat; ships; ship technology; marine technology; tests; marine equipment; quality assurance; Clark's Harbour (ships); marine engineering	report	WAVES (CATNO: 203803)	U
201 a	Hindline, H.O., and F.	Helicopter extractable cold weather liferaft - A design and development	re	Marine Technology	1982, October	unavail.	unavail.	Helicopter extractable cold weather liferaft - A design and development history (in "Marine Technology")	article	Marine Technology (Vol. 19, No. 4, October 1982)	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
	Cirer	history (in "Marine Technology")			(Volume 19, No. 4)						
155a	House, David J.	Marine survival and rescue systems (2nd ed.)	re	Witherby & Co. Ltd.	1997	London	317	Subjects: survival; search and rescue; life saving equipment; life-saving apparatus	book	WAVES (CATNO: 223301, ISBN: 1856091279)	U
118a	HSE	Effect of weather on performance and response times in offshore rescue	re	HSE	1999, May	UK	unavail.	This report provides new information on techniques for quantifying speed reduction of rescue craft due to weather, discussion on the influence of sea state on related activities in the rescue chain, and examples of how such information might be used in response time estimates.	report (OTO 1999 006)	HSE Books	U
30a	HSE/Heriot-Watt University	Diver emergency surface location devices	re	Health and Safety Executive	1999, October	UK	.	An assessment of the performance limitations of a diverse range of diver location aids.	report	HSE RSU (OTO 1999 057)	U
152a	International Electrotechnical Commission	Global Maritime Distress and Safety System (GMDSS): Part 8: Shipborne watchkeeping receivers for the reception of digital selective calling (DSC) in the maritime MF, MF/HF and VHF bands: operational performance and testing requirments, methods of testing and required test results	re	International Electrotechnical Commission	1998	Geneva	37	Subjects: navigation; safety; communication systems; distress signals; search and rescue; safety regulations; alarm systems; satellites; testing; performance assessment	unavail.	WAVES (CATNO: 235277, NUMBERS: Ref. No. IEC 61097-8:1998(E), ISBN: 2831845076)	U
156a	International Electrotechnical Commission	Global Maritime Distress and Safety System (GMDSS): Part 9: Shipborne transmitters and receivers for use in the MF and HF bands suitable for telephony, digital selective calling (DSC) and narrow band direct printing (NBDP): operational and performance requirements, methods of testing and required test results	re	International Electrotechnical Commission	1997	Geneva	56	Subjects: navigation; safety; communication systems; distress signals; search and rescue; safety regulations; alarm systems; satellites; testing; performance assessment	unavail.	WAVES (CATNO: 235278, NUMBERS: Ref. No. IEC 61097-9:1997(E), ISBN: 2831841755)	U
186a	International Maritime Organization	IMO Search and rescue manual	re	International Maritime Organization	1987	London	168	Subjects: search and rescue, methodology, accidents, life saving equipment, survival at sea, manuals, international agreements	manual	WAVES (CATNO: 209486, ISBN: 9280112252)	U
144a	International Maritime Organization . International Civil Aviation Organization	IAMSAR Manual: international aeronautical and maritime search and rescue manual: Volume II: mission coordination	re	IMO/ICAO	1999	unavail.	unavail.	The primary purpose of the three volumes of the International Aeronautical and Maritime Search and Rescue Manual (IAMSAR Manual) is to assist states in meeting their own search and rescue (SAR) needs, and obligations they accepted under the Convention on International Civil Aviation, the International Convention on Maritime Search and Rescue, and the International Convention for the Safety of Life at Sea (SOLAS). Volume II, Mission Coordination, assists personnel who plan and coordinate SAR operations and exercises.	manual	WAVES (CATNO: 237956, NUMBERS: Doc 9731-AN/958)	U
146a	International Maritime Organization . International Civil Aviation Organization	IAMSAR Manual: international aeronautical and maritime search and rescue manual: Volume III: mobile facilities	re	IMO/ICAO	1998	unavail.	unavail.	The primary purpose of the three volumes of the International Aeronautical and Maritime Search and Rescue Manual (IAMSAR Manual) is to assist states in meeting their own search and rescue (SAR) needs, and obligations they accepted under the Convention on International Civil Aviation, the International Convention on Maritime Search and Rescue, and the International Convention for the Safety of Life at Sea (SOLAS). Volume III, Mobile Facilities, is intended to be carried aboard rescue units, aircraft, and vessels to help with performance of a search, rescue, or on-scene coordinator function and with aspects of SAR that pertain to their own emergencies.	manual	WAVES (CATNO: 237957, NUMBERS: Doc 9731-AN/958)	U
150	International	IAMSAR Manual: international	re	IMO/ICAO	1998	unavail.	unavail.	The primary purpose of the three volumes of the International	manu	WAVES (CATNO: 237952,	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
a	Maritime Organization, International Civil Aviation Organization	aeronautical and maritime search and rescue manual: Volume I: organization and management						Aeronautical and Maritime Search and Rescue Manual (IAMSAR Manual) is to assist states in meeting their own search and rescue (SAR) needs, and obligations they accepted under the Convention on International Civil Aviation, the International Convention on Maritime Search and Rescue, and the International Convention for the Safety of Life at Sea (SOLAS). Volume I, organization and management, discusses the global SAR system concept, establishment and improvement of national and regional SAR systems and cooperation with neighbouring states to provide effective and economical SAR services.	al	NUMBERS: Doc 9731-AN/958)	
164a	Jones, S., M. Simard, and D. Blodgett	Study on electronic technologies in search and rescue	re	Transport Canada	1994	Montreal, Quebec, Canada	84	Subjects: aids to navigation; boats and boating; Canada; electronic equipment; search and rescue operations	report	WAVES (CATNO: 201026, NUMBERS: TP 12211 E)	U
178a	Leith International Conference	Leith International Conference: Tenth International Conference and Exhibition on Offshore Search and Rescue, marine communications, marine and aviation safety (October 29-31, 1990, Edinburgh, Scotland)	re	Leith International Conference	1990	Edinburgh, Scotland	unavail.	Subjects: conferences, search and rescue, health and safety, marine transportation, accidents	proceedings	WAVES (CATNO: 239078)	U
198a	Lewandowski, E.M., and W.E. Klosinski	Rotating arm captive model tests of the U.S. Coast Guard prototype 47-FT motor lifeboat	re	Coast Guard Research & Development Center	1998	USA	unavail.	The USCG prototype 47-FT Motor Lifeboat experienced transient roll angles of as much as 40 degrees in a turn at 27 knots with 30 degrees of rudder. The prototype was modified to correct this problem, by moving the rudders to a vertical position, vice 15 degrees outboard angle. The tests reported on here were part of an effort to develop a computer simulation of this snap roll phenomenon. Captive rotating arm tests were conducted using a 1/9.032 scale model of the 37-FT Motor Lifeboat. the model was fully appended, with the propeller driven by an electric motor. Tests were conducted at two speeds, two turning radii, and a range of drift and roll angles. The results are presented in tabular and graphical form. Curves through the data were drawn using a computer plotting package which did not yield the equations for the curves drawn.	report	WAVES (CATNO: 234910, NUMBERS: AD-A358381)	U
166a	MacDonald, C.R.	Life raft leeway divergence angles effects on search planning	re	Transport Canada	1994	Canada	24	Subjects: liferafts, search and rescue operations	report	WAVES (CATNO: 207016)	U
192a	Marine Operations Branch of Canada	Marine search and rescue in Atlantic area	re	Marine Opertations Branch	1961	Canada	26	Subjects: Canada, ANW, Atlantic, Northwest, search and rescue, emergency vessels, marine accidents	unavail.	WAVES (CATNO:187130)	U
215a	Ministry of Defence (UK)	The future provision of Royal Air Force Search and Rescue helicopters	re	Ministry of Defence (UK)	1992, October	UK	unavail.	The future provision of Royal Air Force Search and Rescue helicopters	unavail.	unavail.	U
153a	National Search and Rescue Program (Canada), National Search and Rescue Secretariat	Directory of Canadian Search and Rescue Organizations	re	National Search and Rescue Secretariat	1998	Ottawa, Canada	unavail.	Subjects: Canada; search and rescue; survival at sea; directories	directory	WAVES (CATNO: 166283, NUMBERS: NSS pub. no. NSS-SARDIR07-E; DSS cat. no. D2-95/1998E, ISBN: 0662261097)	U
174a	National Search and	Appraisal of marine search and rescue requirements in extreme	re	National Search and Rescue Secretariat	1990	Canada	unavail.	Subjects: search and rescue operations, weather effects	report	WAVES (CATNO: 201320)	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
	Rescue Program (Canada), National Search and Rescue Secretariat	winter weather conditions									
189a	Ohio Department of Education. Trade and Industrial Education Service	Victim rescue	re	Ohio State University	1976	Ohio, USA	276	Subjects: rescue work, first aid in illness and injury	book	WAVES (CATNO: 211161)	U
67a	ORF	Improved detection devices for SAR at sea	re	ORF	1996, August	UK	.	Subject: improved detection devices for SAR at sea	Review of report	ORF, Issue 113 (www.orf.co.uk)	U
70a	ORF	Personnel recovery reviewed	re	ORF	1996, April	UK	.	Subject: personnel recovery	Review of report	ORF, Issue 112 (www.orf.co.uk)	U
160a	Rescue and Environmental Response Canada	Marine search and rescue incidents annual report, 1994	re	Fisheries and Oceans Canada	1996	Ottawa, Canada	40	Subjects: Canada; coastguards; statistics; search and rescue; salvaging; environmental protection; annual reports	report	WAVES (CATNO: 215622, NUMBERS: F&O/5187; MSS cat. No. T38-1-2/1996E, ISBN: 1662245970)	U
169a	Rescue and Environmental Response Canada	Marine search and rescue incidents annual report, 1992	re	unavail.	1993	Canada	34	Subjects: Canada, coastguards, statistics, search and rescue, salvaging, environmental protection, annual reports	report	WAVES (CATNO: 215618, NUMBERS: TP 4244)	U
163a	Rossignol, Michel	Replacement of shipborne and rescue helicopters	re	Library of Parliament, Research Branch	1996	Ottawa, Canada	14	Subjects: Canada, search and rescue, helicopters	report	WAVES (CATNO: 198376, NUMBERS: DSS cat.no. YM32-1/94-3-1996-09E)	U
188a	Safety at Sea International	Lifesaving and rescue in the 1980s (Safety at Sea Symposium - 5th, 1979, London, England)	re	Safety at Sea	1979	unavail.	123	Subjects: conferences, search and rescue, survival at sea, safety devices	proceedings	WAVES (CATNO: 210370)	U
157a	Scarlett, P. and G. Jones	Radar processing for detection of SAR targets using the A1 tracker	re	Raytheon Canada Ltd.	1997	Waterloo, Ontario, Canada	unavail.	Subjects: tracking; detection; radar; search and rescue	report	WAVES (CATNO: 223527, NUMBERS: TP 12987E)	U
179a	Supply and Services Canada et al	Sharing responsibility for safety and survival: a communication strategy for the National Search and Rescue Program	re	National Search and Rescue Secretariat	1989	Ottawa, Canada	103	Subjects: Canada; governments; search and rescue; financing; resources; safety regulations; communication strategy; clients	report	WAVES (CATNO: 218379)	U
97a	Transport Canada	Canadian search and rescue planning (CANSARP) validation - Phase 3	re	Transport Canada	2000, April 28	Canada	2	Summary of Study. The objective of the project was to evaluate and validate the current CANSARP models and methods.	Summary of study (Project No. 9194; Report - Intern	Transport Canada web site (http://www.tc.gc.ca/TDC/projects/marine/9194.htm)	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
									al report for CCG only)		
98a	Transport Canada	Development of a high-speed scanner	re	Transport Canada	1999, October 29	Canada	2	Summary of study. This project is part of a long-term effort to reduce the search time and increase the efficiency of marine search and rescue (SAR) operations.	Summary of study (Project No. 9113, Report: Internal)	Transport Canada web site (http://www.tc.gc.ca/TDC/projects/marine/9113.htm)	U
99a	Transport Canada	Easily recovered life rafts	re	Transport Canada	1999, October 29	Canada	2	Summary of study. The objectives of the project were to: (1) Develop design modifications to facilitate retrieval of a fully loaded, 20-person life raft by a stand-by rescue vessel in high sea states (up to Sea State 7); (2) Develop design standards and performance criteria suitable for the development or revision of current life raft requirements; and (3) Fabricate a prototype and evaluate the system in full-scale trials.	Summary of study (Project No. 8579; Report: TP 13041E, Fleet Technology Ltd., 1997)	Transport Canada web site (http://www.tc.gc.ca/TDC/projects/marine/8579.htm)	U
100a	Transport Canada	Integration of a Global Positioning System (GPS) receiver with a 406 MHz EPIRB	re	Transport Canada	1999, November 30	Canada	2	Summary of study. The objective of the work was to integrate a Global Positioning System (GPS) receiver with a 406 MHz Emergency Position-Indicating Radio Beacon (EPIRB) and to produce four prototypes for evaluation.	Summary of study (Project No. 8081; Report: TP12115E , MPR Teltech Ltd., 1995;	Transport Canada web site (http://www.tc.gc.ca/TDC/projects/marine/8081.htm)	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
									other reports not for release - protected information)		
101 a	Transport Canada	Modular radar interface enhancements	re	Transport Canada	1999, October 29	Canada	2	Summary of study. This project is part of a long-term effort to reduce the search time and increase the efficiency of marine search and rescue (SAR) operations.	Summary of study (Project No. 9082; Report: TP 13236e, Sigma Engineering, 1998)	Transport Canada web site (http://www.tc.gc.ca/TDC/projects/marine/9082b.htm)	U
103 a	Transport Canada	Search and rescue target detection experiment - Phase 3	re	Transport Canada	1998, September 30	Canada	2	Summary of study. The objective of this project was to improve search and rescue (SAR) modeling tools as part of a long-term effort to reduce the search time and increase the efficiency of marine SAR operations.	Summary of study (Project No. 9089; Report: TP 13290E, OCEANS Ltd., 1998 - draft)	Transport Canada web site (http://www.tc.gc.ca/TDC/projects/marine/9089.htm)	U
104 a	Transport Canada	Upgrading an artificial intelligence tracker for search and rescue	re	Transport Canada	2000, April 28	Canada	2	Summary of study. This project was part of a long-term effort to reduce the search time and increase the efficiency of marine search and rescue (SAR) operations.	Summary of study (Proj	Transport Canada web site (http://www tc gc ca/TDC/projects/marine/.9129 htm)	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
									ect No. 9129; Reports: TP 12987E, Raytheon Canada Ltd., 1997; TP 13282E, OCEANS Ltd., 1998 - draft; and TP 13322E, Raytheon Canada Ltd., 1998. Final report pending)		
197 a	Transport Canada	Marine search and rescue in Atlantic area	re	Transport Canada	unavail.	Canada	unavail.	Marine search and rescue in Atlantic area	unavail.	WAVES (CATNO: 25983)	U
171 a	Transport Canada, Canadian Coast Guard, Ship Safety Branch	Standards for rescue boats	re	Transport Canada	1992	Ottawa, Canada	unavail.	Subjects: boats and boating, search and rescue operations	report	WAVES (CATNO: 207171, NUMBERS: TP 7322 E)	U
167 a	Transport Canada, Coast Guard Northern, Arctic Ship Safety	Arctic lifesaving equipment standard	re	Transport Canada	1994	Canada	34	Subjects: equipment and supplies, lifesaving, safety regulations, search and rescue operations, ships	unavail.	WAVES (CATNO: 207119)	U
182	Transport	Review of in-house rescue boat	re	Management	1988	Canada	unavail.	Subjects: management, search and rescue, search and rescue	report	WAVES (CATNO: 201067)	C

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
a	Canada, Management Consulting Services Branch	program		Consulting Services				operations			
53a	UKOOA	Standing By Offshore Installations - The Safe Management and Operation of Vessels	re	UKOOA	1999	UK		These Guidelines are intended to provide Masters and crews of standby vessels, OIMs and other relevant offshore personnel, with general guidance on the conduct of their activities as part of the effective arrangements for the recovery and rescue of personnel.	unavail.	UKOOA (Code 1.55)	U
54a	UKOOA	Standing By Offshore Installations - Survey of Vessels	re	UKOOA	1999	UK		These Guidelines provide guidance for marine surveyors, standby vessels and charterers in assessing the suitability of vessels standing by offshore installations, when they provide the arrangements for effective recovery and response required by offshore health and safety legislation.	unavail.	UKOOA (Code 1.56)	U
300 a	USCG	The AMVER System	re	USCG	1998, December 29	USA	unavail.	Describes the Automated Mutual-assistance Vessel Rescue (AMVER) system, which utilizes computer and radio technology. Today, some 12,000 ships from over 140 nations participate in AMVER, representing approximately 40% of the world's merchant fleet. An average of 2,700 ships are on the AMVER plot each day. The AMVER computer now tracks over 100,000 voyages annually. Over 1,500 lives have been saved by AMVER ships just since 1990. The success of AMVER is directly related to the extraordinary cooperation of ships, companies, rescue authorities, communications carriers and their respective governments in supporting this international humanitarian program to protect life, property, and cargo at sea.	internet document	USCG (www.uscg.mil/hq/g-o/g-opr/amver.htm)	U
116 a	Viking Standby Limited	About Viking Standby Limited	re	Viking Standby Limited	1999, September 20	UK	unavail.	Viking Standby Limited is a Scottish registered company, founded in 1995, which specialises in offshore rescue and recovery and field support services for the oil and gas industry.	internet document	Viking Standby web site (http://www.rsc.co.uk/vikingstandby/about.htm)	U
130 a	VMI	Offshore Rescue	re	VMI	unavail.	UK	23 mins	This film shows in detail the abandonment of an offshore oil installation by totally enclosed lifeboat and the successful evacuation of that lifeboat. Beginning on an offshore platform with the sounding of the general alarm and the gathering at a muster point, a lifeboat is launched and the personnel evacuated from it in three ways: (1) by transfer to rigid inflatable fast rescue craft, (2) by winching up into a search and rescue helicopter, and (e) by transfer to a larger vessel. A great deal of information about totally enclosed lifeboats and what to do once inside them is fully covered. The emphasis is on how to get out of them safely. The importance of patience and discipline for everyone in the lifeboat is underlined.	video	VMI (Code No. 905)	U
194 a	West of England Film Unit Ltd	Rescue from disaster	re	West of England Film Unit Ltd.	1969	UK	18 min	This video details procedures to follow if an inflatable lifeboat is used. Subjects: search and rescue, survival at sea, lifeboats, inflatable craft, safety devices	video	WAVES (CATNO: 225399)	U
1a	WS Atkins Science & Technology	Effect of weather on performance and response times in offshore rescue	re	Health and Safety Executive	1999	UK	59	The report is prepared in two volumes. Volume 1 covers the work carried out by WS Atkins, Volume 2 is comprised of a report submitted to WS Atkins by Heriot-Watt University covering sea-trials aboard a standard vessel. Volume 1 concerns research into the effect of wind and sea-state on the speed with which the two principal forms of vessel used in offshore rescue, stand-by vessels (SBV) and fast rescue craft (FRC), are able to respond to calls to recover men-overboard, the survivors of ditched helicopters, or similar. The speed of response is dependent upon a number of factors, some of which are a function of	report	HSE RSU (report no. OTO 99.006) /HSE Website	U

Ref #	Author	Title/Report No.	Code	Publisher	Date	Place	# pages	Summary/Subject	Form	Location	Class.
								prevailing weather conditions. The effect of weather on both the fundamentals of speed loss for such craft, and human performance have been addressed in this research. this report provides new information on techniques for quantifying speed reduction due to weather, discussion of the influence of sea-state on related activities in the rescue chain, and examples of how such information might be used in re			

A.3 North Sea Data Listings

ID	Author	Title/Call No.	Publisher	Date	Place	# pages	Summary	Form	Location	Class.
00	Oil Companies International Marine Forum (OCIMF)	Results of a Survey Into Lifeboat Safety	OCIMF	July 1994	London and Bermuda	19	Investigation of accidents and incidents involving davit launched TEMPSC, with proposals for (remedial) countermeasures for consideration by industry. The report is based on an industry survey conducted by OCIMF demonstrating most accidents occur during training drills. Although nearly all data comes from marine vessels experience, the lessons are equally appropriate to survival craft installations on fixed offshore platforms and MODU's (etc.).	report	Bercha	U
01	UKOOA/BHAB	Task Force Team Report on CAA Guidance on Risk Assessment for Flights to Normally Unattended Installations	UKOOA/Shell Expro	March 1996	London	51	Industry response to the Civil Aviation Authority's (CAA) risk assessment guidance document. Includes results of studies of historical data and systematic exercises in identifying and assessing the hazards, potential accident types and benefits from rescue and firefighting equipment. Contains a helicopter accidents summary for European North Sea operations (1970-1995), CAA Occurrence Reports for heavy landings or fires offshore and a Helicopter fire Hazop report. (Report is relevant to potential use of helicopters in emergency evacuations offshore).	Report	Bercha	?
02	Hibernia Management and Development Company (HMDC)	The Rationale for the Selection of the Suite of Evacuation Equipment for the Hibernia Platform	HMDC	May 1993	St. John's, Newf'dland Canada	23 +	Report documenting the analysis and rationale used in the selection of the suite of evacuation equipment contained in the Hibernia platform design. Contains useful references to additional (public) data on Lifeboat Occupant Recovery Sea Trials, PROD TEMPSC Launch-assist System and Seasickness in Occupants of TEMPSC's.	Report	Bercha	Conf'l R
03	UKOOA	Guidelines Respecting Standby Vessels for Offshore Installations	UKOOA	1999	London	44	Provides guidance for marine surveyors, standby vessel operators and charterers in assessing the suitability of vessels standing by offshore installations when they provide the arrangements for the effective recovery and response required in emergencies, including full evacuation, rescue and recovery to a place of safety.	Guidelines	Bercha	U
04	UKOOA	Competence and Training in Emergency Response-The Management of	UKOOA	1997	London	Unavail.	Guidelines setting out recommendations on the management of competence and training in emergency response for all persons who work on, or visit, offshore installations in the UKCS.	Guidelines	Bercha	U
05	UKOOA	Emergency Response for Offshore Installations-Management of	UKOOA	1995	London	46	Guidelines to provide those responsible in the offshore industry for devising and assessing emergency response arrangements with broad guidance on methods for assessing, developing and justifying the adequacy of their arrangements for emergency response, including the development of appropriate performance standards for muster, evacuation, recovery and rescue.	Guidelines	Bercha	U
06	UKOOA	Police Roles & Responsibilities for Oil & Gas Offshore Installations in Emergency	UKOOA	1997	London	Unav.	Provides guidance for operating companies with focus on the police approach and immediate response in emergency situations.	Guidelines	Bercha	U

ID	Author	Title/Call No.	Publisher	Date	Place	# pages	Summary	Form	Location	Class.
		Situations-Guidance on								
07	UKOOA	Standing By Offshore Installations-The Safe Management and Operation of Vessels	UKOOA	1999	London	Unav.	Guidelines addressing the operational aspects of the types of equipment which are available to meet Standby Vessel requirements. Addresses the setting of targets for maximum times which should elapse between the alarm sounding and all survivors being in a place of safety. Also addresses helicopter ditching near the installation and escape from installations.	Guidelines	Bercha	U
08	E&P Forum	Lifeboat Safety Guidelines	Oil Industry International Exploration & Production Forum (E&P Forum)	June 1995	London	7	Guidelines addressing lifeboat operational and maintenance aspects, with emphasis on preventing unwanted luanches, pertaining to fixed and floating offshore exploration and production facilities.	Guidelines	Bercha	U
09	E&P Forum	QRA Data Sheet Directory-Evacuation, Escape and Rescue	E&P Forum	August 1998	London	15	Provides QRA data and guidance for EER from both offshore and onshore installations. Contains example data rule sets for EER analysis and generic guidance for evacuation by both sea and air.	Data Sheets	Bercha	U
10	Offshore Design Associates Ltd.	Comparative Physical Model Study of Offshore Evacuation Systems	ODA Ltd./National Research Council of Canada	March 1997	Lake Country, BC, Canada	200+	Report of a study investigating the performance of four offshore evacuation systems for use on fixed and floating offshore installations. (Tank modelling is based on a scaled four-column semi-sub floating unit). The tests show a number of differences between the systems, which are evaluated and discussed in much detail. (Extensive Appendices with full test data and results).	Report	Bercha	U
11	UK Dept. of Transport	Assessment of the Suitability of Standby Vessels Attending Offshore Installations	HMSO	Revised 1991	London	48	Code for the assessment of the suitability of standby vessels for the guidance of the (UK) offshore and standby vessel industries. Covers all essential requirements for standby vessel duties, including emergency evacuation, rescue and recovery to a place of safety.	Code	Bercha	U
12	UK Health & Safety Executive	Report on EESC Visit to ESVAGT (Danish Offshore Rescue Service)	HSE/OTO (OTO 98 153)	August 1998	London	32	Report of a visit by the Emergency Evacuation of Offshore Installations Steering Committee (EESC) to the Danish Offshore Rescue Service (ESVAGT) to obtain lessons learned from the rescue of personnel from the stricken drilling rig WEST GAMMA in August 1990. The rescue was accomplished in particularly hazardous conditions (Beaufort 9, 12 metre waves) where other rescue services had failed.	Report	Bercha	U
13	DNV Technica Ltd.	Update of the UKCS Risk Overview	UK HSE (OTH 94 458)	1995	London	242	Report of a project designed to gain an overview of risk levels in the offshore industry on the UKCS. The study includes helicopter transportation accidents and contains data (in Appendices) on actual North Sea accidents, with some details of escape, evacuation and rescue.	Report	Bercha	U
14	DNV (for Brown & Root Ltd.)	Evacuation, Escape, Rescue and Recovery Analysis for the Viking Phoenix Development	DNV/Brown & Root Ltd.	Nov. 1997	London	56	Report of the analysis of the EER&R facilities for Conoco's Viking Phoenix platforms. The report documents the emergency response systems and procedures, the analysis techniques used to determine the success of the emergency response, a summary of the response possibilities for each accident event, the role of the TR and subsequent rescue and recovery provisions.	Report	Bercha	R Confl.
15	Genesis Oil & Gas Consultants Ltd. (for British Gas E&P)	EERA Update – Morecambe Field Remote Platforms	Genesis/British Gas E&P	Sept. 1996	London	15	Extract from an Escape, Evacuation and Rescue (EER) Study undertaken for British Gas. The extract details adaptation of the 'ARENA' discrete event graphical simulation system to offer a more quantitative and faster alternative to conventional EERA techniques. It details the simulation as a chain of events in the EER process modelled as occurring at distinct points in time to enable complete scenario evaluation with integration of human factors and any effects which are important to evacuation success. The 'ARENA' model has been developed by Hoskyns Operational Research and has been successfully applied to the simulation of EER for a number of British Gas offshore installations, with validation obtained from the agreement	Report (extract)	Bercha	R Confl.

ID	Author	Title/Call No.	Publisher	Date	Place	# pages	Summary	Form	Location	Class.
							of results with BG's own internal data from EER evaluations and drills.			
16	British Gas Technology (for BG E&P)	Description and Validation of the Integrated Risk Assessment Package (IRAP)	British Gas E&P	July 1998	Reading	32	Report providing an overview of the BG IRAP software, including its application to escape, evacuation and rescue event modelling. Includes a comparison between QRA assumptions and IRAP for a specific offshore installation study. It should be noted that IRAP's TEER program (see 217 below) is now used by BG in preference to 'ARENA' (see 215 above)	Report	Bercha	R Conf.
17	BG Technology	The Integrated Risk Assessment Package (IRAP) Technical Manual	BG Technology	1996-8	Loughboro	223	Software user manual giving technical information on all models used within the IRAP application, with information on the applicability of each model, a general description, its limits of applicability, the methodologies used by the models and any suggested values which can be used. Of particular relevance is the Transient Escape, Evacuation and Rescue (TEER) program data which details the complete methodology for analysis of the EER process, with evacuation and rescue probabilities and constants.	Manual	Bercha	R Conf.
18	BG E&P Ltd.	Evacuation, Escape and Rescue Assessment (CP-F-009)	BG E&P Ltd.	April 1993	Reading	52	Company Practice and Specification providing the objectives, scope and requirements for the systematic assessment of the evacuation, escape and rescue (EER) facilities of an offshore installation. Provides formal guidance necessary to allow an assessor to undertake an EER assessment (or, EERA).	Company Practice	Bercha	R Conf.
19	UKOOA	Evacuation, Escape and Rescue Technical Advisory Group (EERTAG) draft Minutes of 16th Meeting	EERTAG/United Kingdom Offshore Operators Association (UKOOA)	June 1997	London	9	Minutes indicating the past, present and intended work undertaken by the EERTAG organisation. This document is provided as a reference to the existence of EERTAG, with contact names and organisations within the group and reference to publications resulting from the group's undertakings.	Minutes of Meeting	Bercha	U
20	W S Atkins Science and Technology (for UK HSE Offshore Safety Division)	Evacuation, Escape and Rescue West of Shetlands – Summary	W S Atkins/HSE OSD	May 1997	London	3	Summary only of a study report commissioned by the UK HSE (OSD) into the availability and operability of a range of production platform evacuation and rescue methods which are likely to be used in new field developments in the UK West of Shetland basin. Includes summary of main findings of the study work.	Report Summary	Bercha	U
21	UK HSE Offshore Technology Division	Ocean Odyssey Emergency Evacuation - Analysis of Survivor Experiences (OTO 96 009)	HSE Offshore Technology	April 1997	London	38	Report presenting information on the evacuation of the Ocean Odyssey semi-submersible drilling rig following a blow-out in September 1988. Presents the HSE analysis of those areas for improvement which would offer better prospects of survival during future emergency evacuations. The Ocean Odyssey incident remains the only occasion when TEMPSC have been used during an emergency evacuation of a North Sea installation. It therefore represents a unique body of experience.	Report	Bercha	U
22	UKOOA/EERTAG	EERTAG Review of Ocean Odyssey Emergency Evacuation	UKOOA/EERTAG	1997	London	21	Report presenting EERTAG's review of the primary issues of concern raised in the HSE analysis of the Ocean Odyssey incident (see 221 above). The report covers the evacuation, rescue, recovery and aftercare of survivors who either evacuated the installation by TEMPSC or escaped by jumping directly into the sea.	Report	Bercha	U
23	UKOOA/EERTAG	Review of Recommendations for Rescue and Recovery	UKOOA/EERTAG	1997	London	43	Report setting out the views of EERTAG on progress towards implementation of recommendations arising from research sponsored by the UK HSE (OSD) relating to the rescue and recovery of survivors from offshore installations. The report provides technical advice to the offshore industry by identifying the most effective enhancements to rescue and recovery systems. Also contains a useful reference summary of publications reviewed.	Report	Bercha	U
24	Sable Offshore	Overview of Offshore Platform Sea Evacuation Systems Based on	SOEP	1997	Halifax, NS Canada	4	Overview of an evaluation by SOEP of primary sea evacuation systems using TEMPSC. Provides indication of expected lifeboat performance	Summary	Bercha	U

ID	Author	Title/Call No.	Publisher	Date	Place	# pages	Summary	Form	Location	Class.
	Energy Project	Conventional Survival Craft (Lifeboats)					criteria for different weather conditions related to the success of emergency evacuation and indicates those areas having the greatest influence on the potential for successful evacuation by sea using TEMPSC. Also summarises historic lifeboat evacuation failure data.			
25	UKOOA/EERTAG	Work Group Methodology for Assessing Novel [Evacuation] System Proposals	UKOOA/EERTAG	Nov. 1993	London	9	Presents a methodology for providing a 'coarse filter' assessment of offshore evacuation systems by means of a structured criteria check list. Includes a 'pro-forma' check list example, together with a completed example of the same base data.	Criteria Check List	Bercha	U

A.4 East Coast Marine Equipment Specifications

SYSTEM	DESCRIPTION	CONTACT INFO
BRIDGE	WALKABLE, DRY, EXTENDED EVACUATION SYSTEM	MGK (SCOTLAND) Polbeth Industrial Estate Polbeth West Calder West Lothian EH55 8TJ Scotland UK Tel: 011-44-1506-871757 Fax: 011-44-1506-8734100 Sales@mgkscot.demon.co.uk www.ngkscot.demon.co.uk
BRIDGE	SEE ABOVE	SIMPSON-DAVITS Building 13 Shamrock Quay William Street Southampton SO14 5Q1 UK Tel: 011-44-1703-631834 Fax: 011-44-1703-330998 Sales@simpson-davits.co.uk
INFLATABLE CHUTES	GRAVITY LAUNCHED SYSTEM, ADAPTABLE, TO ALL WEATHER AND SEA CONDITIONS	DBC MARINE SAFETY Zodiac International Marine Division 2 Rue Maurice Malet 92130 ISS-Y Malinicaux France Tel: 011-33-141-232323 Fax: 011-33-141-232398 zodiac.czht@aol.com www.zodiac.fr

SYSTEM	DESCRIPTION	CONTACT INFO
INFLATABLE CHUTES	MEC MARINE EVACUATION CHUTE	DUNLOP BEAUFORT 12351 Bridgeport Road Richmond BC V6V 1J4 Tel: 604-278-3221 Fax: 604-278-7812 Contact: Paul Higginbotham
INFLATABLE CHUTES	SEE DBC SYSTEM	CHEMRING P.O. Box 326 1420 Wolf Creek Trail Sharon Center Ohio 442274-0326 USA Tel: 216-239-1352 Fax: 216-239-1352 Contacts: Paul Jensen James Connor
INFLATABLE CHUTES	SEE DBC SYSTEMS	LIFESLING 3182 ORLANDO Drive Mississauga ON L4V 1R5 Tel: 905-677-4211 Fax: 905-677-7618 zodiac.czhi@aol.com www.zodiac.fr
PROD	PREFERRED ORIENTATION AND DISPLACEMENT	MARLOW ROPES Diplocks Way BN27 3JS United Kingdom Tel: 011-44-1323-847234 Fax: 011-44-1323-440093 marine@marlowropes.com

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GEMEVAC	EMERGENCY EVALUATION SYSTEM	GEC ALSTHOM ENGINEERING SYSTEMS Cambridge Rd Whetstone Leicester UK LE8 6LH Tel: 011-44-1785-56221 Fax: 011-44-1785-274676 Contact: Keith Burdis www.gec.co.uk
TOES	ENHANCED DRY ESCAPE SYSTEM	EM&I SAFETY SYSTEMS Maple House Maple Road Bramhall Stockport SK7 2DH Cheshire Tel: 011-44-61-440-8848 Fax: 011-44-61-440-9833
PROD	PREFFERRED ORIENTATION AND DISPLACEMENT	SCHAT-HARDING 5470 Rosendal Norway Tel: 011-47-53-48166 Fax: 011-47-53-481784 Sales@schat-harding.co.uk
DAVIT-LAUNCHED LIFEBOATS		TECHNOFIBRE 51 Shipyard Road 628139 Singapore Tel: 011-65-206142 Fax: 011-65-2861435 lifeboat@technofibre.com www.technofibre.com

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DAVIT-LAUNCHED LIFEBOATS		WATERCRAFT HELLAS 34 Asklipiois St. 18545 Piraeus Greece Tel: 301-266142 Fax: 301-1301-4175710 info@watercraft.gr
DAVIT-LAUNCHED LIFEBOATS		NORSAFE P.O. BOX 115 N-4852 Faervik Norway Tel: 011-47-37-05-8500 Fax: 011-47-37-05-8501 mail@norsafe.com www.norsafe.no Contact: Oskar Havneild
DAVIT-LAUNCHED LIFEBOATS		SURVIVAL SYSTEMS INTERNATIONAL UK LTD Viking Rd. Gapton Hall Industrial Estate Great Yarmouth NR31 0NU UK Tel: 011-44-05941 Fax: 011-44-1493-055425 Survivalsystemscapsule@ Demon.co.uk
DAVIT-LAUNCHED LIFEBOATS		SCHAT-WATERCRAFT 912 Highway 90 East New Ibernia LA 70560 Tel: 318-365-5451 Fax: 318-367-2816

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LADDERS		SEATON MECHANICAL INSTALLATION LTD Unit 2A Block 9A South Avenue Blantyre Industrial Estate Blantyre UK G72 9XX Tel: 011-44-1698-822205 Fax: 011-44-1698-821299 Contact: James Seaton
LADDERS		RAVENS MARINE 3295 Old Dixie Highway Kissimmee FL 347744 USA Tel: 407-935-9799 Fax: 407-935-9436 www.ravensmarine.com
LADDERS		CHESAPEAKE FABRICATIONS Tel: 410-546-5543 Fax: 410-543-1873
LADDERS		MERCO MARINE 65 Merco Rd. Wellsberg WV 26070 USA Tel: 304-937-3006 Fax: 304-737-3008 merco@mercomarine.com www.mercomarine.com

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LADDERS		WINNISPESAUKEE MARINE CONSTRUCTION 60 Glidden Rd. Gilford New Hampshire 03246 USA Tel: 603-923-7768 Fax: 603-293-8106 Winni@cyberportal.com www.lakewinnicon.com
LADDERS		DIXON MARINE PRODUCTS P.O. BOX 67 Warkworth New Zealand Tel: 64-9-425-8831 Fax: 64-9-425-7343 dixon@xtra.co.nz
LADDERS		SEA CONTRACTORS (S) PTE LTD BLF 7 Defu Lane10# D1-538 Singapore 539188 Tel: 65-2836363 Fax: 65-171-6623 sales@sea-contractors.com www.wordyellowpages.com /seacontractor
LADDERS		NAUTICAL SAFETY P.O. Box 590462 Houston Texas 77592-0462 Tel: 713-643-7570 Fax: 713-643-6975 info@nautsafe.com www.nautsafe.com

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LADDERS		ACL MARINE PRODUCTS 52 Manchester St. New Hampshire Tel: 603-558-1276 Fax: 603-668-1281 Sales@aclindustries.com
LADDERS	SELSTAIR	SELANTIC N-5363 Agontes Norway Tel: 011-47-5632600 Fax: 011-47-5632-6010 selantic@selantic.com www.selantic.com
LADDERS	JASON'S LADDER	LAND &MARINE PRODUCTS Kinglsey House Old Park Farm Kinglsey Borden Hampshire UK GU35 9LU Tel: 011-44-420-474484 Fax: 011-44-420-489002
LADDERS	EMBARKATION PILOT'S LADDER JACOB'S LADDER	HYGRAPHA Liebigstrabe 67 D-22-113 Hamburg Germany Tel: 011-49-40-7310530 Fax: 011-49-40-73105310 h ygrapha@hygrapha.com Contacts: Nigel Watling Tony Winchester

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SKYSCAPE	BASED ON SELANTIC CHUTE DEPLOYS INTO A SERIES OF FLOATING LIFERAFTS AT SEA LEVEL	SELANTIC UK LTD Chequers Parade Wycombe Road Prestwood UK HP16 OPN Tel: 011-44-1494-891212 Fax: 011-44-1494-891233 Contact: Phil Dixon
TELESCAPE	EMERGENCY EVACUATION SYSTEMS THAT ALLOWS PLATFORM PERSONNEL TO MAKE A QUICK ESCAPE FROM HIGH LEVEL ABOVE THE SEA DIRECTLY ONTO A LIFERAFT	TELESCAPE (UK) 1 Boundary Road West Harfreys Industrial Estate Great Yarmouth UK NR31 OLW Tel: 011-44-1493-440785 Fax: 011-44-1493-44078 Contact: Graham Carey
STAIRS		DATREX P.O. Box 1150 13878 Highway 165 Kinder LA 70648 Tel: 318-738-4511 Fax: 318-738-5675 sales@datrex.com www.datrex.com
STAIRS		LHR SERVICES AND EQUIPMENT 7815 Hansen Houston Texas 77601 Tel: 713-943-234 Fax: 713-943-1231 sales@lhrservices.com www.lhrservices.com

SYSTEM	DESCRIPTION	CONTACT INFO
STAIRS		TAYLORTEL INC. 16152 East Club Deluxe Rd. Hammond Louisiana 70403 Tel: 504-542-6266 Fax: 504-542-6371 taylor@net-2000.net www.taylor.com
STAIRS		ROCKWATER MANUFACTURING CORP. 10950 Route 110 Farmingdale NY 11735 USA Tel: 516-777-4633 Fax: 516-777-4634 info@rockwater.com www.rockwater.com
SCRAMBLING NETS		BILLY PUGH COMPANY 1415 Northwater P.O. Box 802 Corpus Christi Texas 78401 Tel: 361-884-9351 Fax: 361-888-5806 bpc@intcomm.net www.billypugh.com
SCRAMBLING NETS		REDDEN NET CO. 1638 West 3rd Avenue Vancouver BC V6J K2Z Tel: 604-736-5636 Fax: 604-736-9161 reddenet@istar.ca www.redden.net.com

SYSTEM	DESCRIPTION	CONTACT INFO
SCRAMBLING NETS		IMP FISHING GEAR 44 South St. New Bedford Massachusetts 02740 USA Tel: 508-993-0010 Fax: 508-993-9005 info@impfishing.com www.impfishing.com
SCRAMBLING NETS		SMITH MARINE ENTERPRISES Tel: 1-800-929-3701 Fax: 941-939-5712 sales@smithmarine.com www.smithmarine.com
SCRAMBLING NETS		PACIFIC FIBRE & ROPE CO. Wilmington California Tel: 310-834-4567 Fax: 310-835-6781 pacfils@worldnet.cett.net
SCRAMBLING NETS		MARKUS LTD P.O. Box 13 IS-222 Hafnarefjiorour Iceland Tel: 354-565-1476 Fax: 354-565-2775 markslife@isholf.is www.markusnet.com
SCRAMBLING NETS		STERLING NET & TWINE 18 Label Street Montclair NJ 07042 Tel: 1-800-342-0316 Fax: 1-800-832-6387

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SCRAMBLING NETS		COSALT SAFETY AND PROTECTION Unit 7 West Harding Shore Trading Estate Westshore Rd. Granton Edinburgh UK EH5 1QF Tel: 011-44-131-552-0011 Fax: 011-44-131-552-8306 www.cosalt.co.uk
SCRAMBLING NETS		MARINE WHOLESALERS 3018 Earhart Blvd. New Orleans LA 70125 USA Tel: 504-522-6333 Fax: 504-561-5735
SCRAMBLING NETS		HYGRAPHA Liebigstra 67 Hamburg Germany D-22113 Tel: 011-49-40-7310530 Fax: 011-49-73105310 hygrapha@hygrapha.comwww.hygrapha.com
LIFERAFTS	COASTER SY6 CLASS V MP OPEAN SEA MP RACING BOMBARD	ZODIAC HURRICANE TECHNOLOGiES 3182 Orlando Drive Unit 10 Mississauga ON L4V 1R5 Tel: 905-677-4211 Fax: 905-677-7618 zodiac.czht@aol.com www.zodiac.fr
LIFERAFTS		VIKING LIFESAVING EQUIPMENT P.O. Box 3060 Dk-6710 Esberg V Denmark Tel: 011-45-76-118100

SYSTEM	DESCRIPTION	CONTACT INFO
		Fax: 011-45-76-11810 www.viking-lif.com
LIFERAFTS	OCEAN COASTLINE	AVON INFLATABLES 3182 Orlando Drive Unit 10 Mississauga ON L4V 1R5 Tel: 905-677-4211 Fax: 905-677-7618 zodiac.czht@aol.com www.zodiac.fr
LIFERAFTS		DEUTSCHE SCHAUCHBOOTFABRIK Hans Scheibert GMBH & Co. KG Postfach 1196 Angerweg 5 D-37628 Escherhausen Germany Tel: 011-49-5534-3010 Fax: 011-49-5534-301200
LIFERAFTS	MD-1, MD-2	SWITLICK 1325 EAST STATE ST. P.O. BOX 1328 Trenton NJ USA 08607-1615 Tel: 609-587-3300 Fax: 609-586-6647 info@switlik.com www.switlik.com
LIFERAFTS	GIVENS MARINE SURVIVAL	GIVENS MARINE 548 Main Street Tiverton Rhode Island 02870 USA Tel: 1-800-328-8050 Fax: 401-625-1099 info@givensliferafts.com

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LIFERAFTS	RAFT MODELS SG-D, SG-F, SG-B, SG-C	SAMGONG INDUSTRIAL CO. 956 Dogok-Dong Kanggram-ku Seoul Korea Tel: 02-3462-3888 Fax: 02-3462-3887 sales@samgong.com
LIFERAFTS	4,6,8, VALISES	BFA Liferafts Inc. of Puerto Rico Calla Guayama #610 Miramar Puerto Rico 00907
LIFERAFTS		DUNLOP Corporation Road Birkenhead L41 8JX Great Britain Tel: 011-44-151-653-6464 Fax: 011-47-652-8270 Contacts: Philip Higginbottom
LIFERAFTS		INTERNATIONAL SAFETY PRODUCTS Ryeground 6 Ryeground Lane Formby Liverpool UK L37 7EQ Tel: 011-44-17048-31673 Fax: 011-44-17048-74909 Contact: P. Bibby
LIFERAFTS	SMR TECHNOLOGIES	CREWSAVER LIFERAFTS P.O. Box 326 1420 Wolf Creek Trail Sharon Center OH 44274-03626 USA Tel: 216-239-1000

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LIFERAFTS	THROW OVER DAVIT LIFEBOATS	ELLIOTT INFLATABLE LIFERAFTS 3874 Fiscal Court Suite 200 Riveria Beach Florida 33404 USA Tel: 407-842-8000 Fax: 407-842-0987
LIFERAFTS	THROW OVERBOARD DAVIT LAUNCHED FERRYMAN	RFD 11-13 Ockford Road Godalming Surrey GU7 1QU UK Tel: 011-44-483-414122 Fax: 011-44-483-429940 Contacts: Denise Head Geoff Billington
LIFERAFTS		URETEK LTD 30 Lenox Street P.O. Box 326 New Haven Conneticut 06513 USA Tel: 203-468-0342 Fax: 203-469-7385
LIFERAFTS	TRANSOCEAN OFFSHORE COASTLINE CRUISER	PLASTIMO LIFERAFTS School Lane Chandlers Ford Industrial Estate Eastleigh Hampshire UK Tel: 011-44-1703-262211 Fax: 011-44-1703-266236 sales@plastimo.co.uk

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LIFERAFTS		BALLOONFABRIK AUSBERG P.O. Box 1013-27 D-86003 Ausberg Germany Tel: 821-4202 Fax: 821-4202140
DONUTS	SEMI-DRY ESCAPE SYSTEM	EM& I SAFETY SYSTEMS LTD Maple House Maple Road Bramhall Stockport SK72 2DH Chesire United Kingdom Tel: 011-44-61-440-8848 Fax: 011-44-61-440-9633
ROPE		SAMYANG MARINE 24 Ho Dae Dong Dae Gyu Mansion Shop 1 Ga 1 Bunkii Dae Pyung Dong Young Do Ko Pistan Korea 606-021 Tel: 82-51-418-6756-61 Fax: 82-51-418-6764 www.samyang.com
ROPE		LANGMAN ROPE v.o.f. P.O. Box 225-3860 AE Amperestraat 3-3861 NC Nijerk The Netherlands Tel: 31-33-246-19-86 Fax: 31-33-2461577 toufabrick@neropes.com ww.langman.com
ROPE		NEW ENGLAND ROPE 848 Airport Road

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		Fall River MA 02720-4735 USA Tel: 508-670-8200 Fax: 508-679-2363 neropes@neropes.com www.neropes.com
ROPE		WIRE ROPE INDUSTRIES 25 Akerley Blvd. Burnside Industrial Park Dartmouth NS B3V 1J3 Tel: 902-468-7588 Fax: 902-468-1980 mailboax@wirerope.com www.wirerope.com
ROPE		RAMUSSEN COMPANIES 8279 5TH Avenue P.O. Box 81206 Seattle Washington 98108 Tel: 206-762-3700 Fax: 206-752-5003 rasequip@aol.com www.ramussenco.com
ROPE		REDDEN NET CO. 1638 West 3rd Avenue Tel: 604-736-5636 Fax: 604-736-9161 reddnet@istar.ca www.redden-net.com
ROPE		MIAMI CORDAGE 2475 NW 39 Street Miami FL 33142 Tel: 305-636-3000 Fax: 305-635-0530 sales@imakerope.com

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		www.imakerope.com
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ROPE		MARINE WHOLSALERS 3038 Earhart Blvd. New Orleans LA 70125 USA Tel: 504-522-6333 Fax: 504-581-5736 www.slingmaster.com
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